

Edexcel GCSE

Engineering

(Double Award) (2EG02)

For first teaching from 2009

Sample Assessment Materials



Welcome to the Edexcel GCSE 2009 Engineering Sample Assessment Materials

These sample assessment materials have been developed to give you and your students a flavour of the actual exam papers and mark schemes so they can experience what they will encounter in their live assessments. They feature:

- **Accessible papers** using a mixture of questions styles where appropriate – we've worked hard to ensure the papers are easy to follow with an encouraging tone so that the full range of students can show what they know.
- **Clear and concise mark schemes** for each paper, outlining what examiners will be looking for in the assessments, so you can use the sample papers with students to help them prepare for the real thing.
- **Supported controlled assessment**, including sample controlled assessment materials to show you the sort of activity students will undertake. Used in conjunction with the guidance in the Teacher's Guide, these samples will help you manage the controlled assessment in your centre and help students achieve their best.

Our GCSE Engineering qualification for first teaching in 2009 will be supported better than ever before.

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www.edexcel.com/gcse09

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Edexcel GCSE

Engineering (Double Award)

Unit 1: Engineering Design and Graphical Communication

Sample Controlled Assessment Material

Paper Reference

5EG01/01

You do not need any other materials.

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Controlled Assessment task

For this task you will produce a design solution for an engineered product which includes either:

- Mechanical components or;
- Hydraulic/pneumatic components or;
- Electrical components.

In order to complete this task you will undertake the following **design** activities:

Section	Sub-section	Suggested times
1. Investigation	a) Analysing the brief	2–3 hours
	b) Details of the design criteria and production constraints	
2. Design	c) Ideas and design solutions	5–8 hours
	d) Testing and selecting the final solution	
3. Graphical Communication	e) Interpreting engineering drawings and circuit diagrams	15–20 hours
	f) Selecting engineering drawing techniques	
	g) Producing engineering drawings	
4. Presentation	h) Presenting and modifying the final design solution	1–2 hours

Suggested products could include:

1. Security device, eg

- Shed alarm
- Bike alarm
- Dummy surveillance camera.

2. Remote control, eg

- Window curtains/blinds
- Entry barrier.

3. Lifting devices, eg

- Hoist such as for lifting a small load vertically, or lifting a cycle on to a roof-rack
- Wheelchair lifting device.

4. Sorting device, eg

- Coins
- Metallic/plastic components.

The suggested products can be contextualised to suit local centre/employer needs or where access to particular resources may be an issue. However, centres must ensure that the product chosen for this unit is different from that used in Unit 2.

Controlled conditions

The preparation and production of students' designs and drawings must take place under controlled conditions. Students will only be allowed to produce their design portfolios during lesson time when supervised by a teacher or invigilator. Student's work must be collected in at the end of each lesson and handed back at the beginning of the next lesson.

Feedback control

Teachers are allowed to provide regular formative feedback throughout the creative design process. Student progression should be supported by the centre's own Assessment for Learning (AFL) strategies.

Demonstrations of practical activities are allowed in order to develop knowledge, understanding and skills and to identify health and safety issues relating to specific tools, equipment and processes.

Collaboration control

Where group-work occurs, evidence of individual contributions must be clearly identified and recorded.

Resources

Access to resources is determined by those available to the centre.

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Assessment criteria

Section	Sub-section	Marks	Level of response	Mark range
Investigation (12 marks)	a) Analysing the brief*	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> Analysis of the brief to identify basic client needs, with identification of some key features of the engineered product. The key features identified are briefly listed, make little use of correct grammar and include frequent spelling mistakes, with incorrect or inappropriate use of terminology. 	1–2
			<ul style="list-style-type: none"> Analysis of the brief to identify the main client needs, with a description of the key features of the engineering product. The description of key features includes a sound standard of spelling and punctuation. Terminology is mostly used appropriately. 	3–4
			<ul style="list-style-type: none"> Analysis of the brief to explain the main client needs, with a justification of the key features of the engineering product. The analysis makes good use of accurate terminology and grammar, and few punctuation and spelling errors. 	5–6
	b) Details of the design criteria and production constraints*	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> Production of a design specification that identifies the basic details of the product criteria and production constraints. Design specification makes little use of correct grammar and includes frequent spelling mistakes, with incorrect or inappropriate use of terminology. 	1–2
			<ul style="list-style-type: none"> Production of a design specification that describes some of the main details of the product criteria and production constraints. Details are presented using adequate standards of legibility, spelling and punctuation. Terminology is mostly used appropriately. 	3–4
			<ul style="list-style-type: none"> Production of a design specification that explains the main details of the product criteria and production constraints. Grammar, punctuation and few spelling errors and there is good use of accurate terminology. 	5–6

Section	Sub-section	Marks	Level of response	Mark range
Design (12 marks)	c) Ideas and design solutions*	6	Level of response not worthy of credit.	0
			Generation of basic design ideas and the development of simple design solutions. Ideas and solutions include frequent errors in spelling and grammar. Terminology is not used accurately or appropriately.	1–2
			Generation of alternative design ideas and the development, in some detail, of design solutions. Ideas and solutions are presented using a sound standard of spelling and punctuation. Terminology is mostly used appropriately.	3–4
			Generation of imaginative design ideas and the development of detailed and appropriate design solutions. Few grammar, punctuation and spelling errors and there is good use of accurate terminology.	5–6
	d) Testing and selecting the final solution*	6	Level of response not worthy of credit.	0
			Present limited testing against some of the design criteria in order to select the final design solution. There is little evidence of why the final design idea was chosen. Written evidence is poorly presented with little use of appropriate terminology.	1–2
			Present a range of testing against the design criteria in order to select the final design solution. Describe, in some detail, how the final design solution meets the main design criteria. Written evidence is generally free of spelling and grammatical errors and terminology is mostly used accurately and appropriately.	3–4
			Present objective testing against the design criteria in order to select and justify the final design solution. Written evidence is clear, with consistent use of spelling, punctuation and grammar and there is good use of accurate terminology.	5–6

Section	Sub-section	Marks	Level of response	Mark range
Graphical communication (20 marks)	e) Interpreting engineering drawings and circuit diagrams	6	Level of response not worthy of credit.	0
			Read engineering drawings and circuit diagrams and name the components/features.	1–2
			Read and interpret engineering drawings and circuit diagrams and name and explain the function of some of the components/features.	3–4
			Read and interpret engineering drawings and circuit diagrams and name and explain the function of each component/feature.	5–6
	f) Selecting engineering drawing techniques	6	Level of response not worthy of credit.	0
			Selection and use of a limited range of engineering drawing techniques to communicate some aspects of the final solution. The selection of drawing techniques takes some account of the purpose of the drawing.	1–2
			Selection and use of a range of engineering drawing techniques to communicate, in some detail, the final solution. The selection of drawing techniques takes some account of the purpose of the drawing and the intended audience.	3–4
			Selection and use of an effective range of engineering drawing techniques to communicate, in detail, the final solution. The selection of drawing techniques takes considered account of the purpose of the drawing and the intended audience.	5–6
	g) Producing engineering drawings	8	Level of response not worthy of credit.	0
			Production of basic engineering drawings that show limited compliance with sector-specific standards and conventions. Drawings include the use of some relevant common standard symbols.	1–2
Production of engineering drawings that comply, in some detail, with sector-specific standards and conventions. Use of a range of relevant standard symbols for the named components.			3–5	
Production of appropriate manual and CAD engineering drawings that comply with sector-specific standards and conventions.			5–6	

Section	Sub-section	Marks	Level of response	Mark range
Presentation (6 marks)	h) Presenting and modifying the final design solution*	6	Level of response not worthy of credit.	0
			Limited description of how the final design solution meets the client design brief and design specification, identifying some relevant modifications. Written evidence is poorly presented with little use of appropriate terminology.	1-2
			Description, in some detail, of how the final design solution meets the client brief and design specification, describing relevant modifications. Written evidence is generally free of errors and terminology mostly used appropriately.	3-4
			Detailed explanation of how the final design solution meets the brief and specification, explaining relevant modifications. Written evidence is clear, with few, if any spelling or punctuation mistakes and there is good use of accurate terminology.	5-6
Total marks:		50		50

* Opportunity for students to be assessed on quality of written communication.

Edexcel GCSE

Engineering (Double Award)

Unit 2: Engineered Products

Sample Controlled Assessment Material

Paper Reference

5EG02/01

You do not need any other materials.

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Controlled Assessment task

For this task you will produce an engineered product that includes either:

- Mechanical components or;
- Hydraulic/pneumatic components or;
- Electrical components.

In order to complete this task you will undertake the following activities:

Section	Sub-section	Suggested times
1. Use information	a) Read and interpret a product specification and engineering drawings/diagrams	Evidenced throughout
	b) Produce a production plan which includes information about resources and processing requirements	
2. Plan	c) Produce a production plan which includes information about production details and constraints	7–2 hours
	d) Identify, prepare and use materials	
3. Make	e) Identify, prepare and use parts and components	15–20 hours
	f) Select and use processes, tools and equipment	
	g) Produce an engineered product	
4. Test	h) Testing and evaluation	1–2 hours

Suggested products could include:

- 1. Low voltage light**, eg
 - Table lamp
 - Handheld torch.
- 2. Security device**, eg
 - Shed alarm
 - Bike alarm
 - Dummy surveillance camera.
- 3. Electrically operated toy**, eg
 - Model car
 - Automaton.
- 4. Remote control**, eg
 - Window curtains/blinds
 - Entry barrier.

The suggested products can be contextualised to suit local centre/employer needs or where access to particular resources may be an issue. However, centres must ensure that the product chosen for this unit is different from that used for Unit 1.

Controlled conditions

The preparation and production of students' work must take place under controlled conditions. Students will only be allowed to produce their engineered products and the related portfolios during lesson time when supervised by a teacher or invigilator. Student's work must be collected in at the end of each lesson and handed back at the beginning of the next lesson.

Feedback control

Teachers are allowed to provide regular formative feedback throughout the creative design process. Student progression should be supported by the centre's own Assessment for Learning (AFL) strategies.

Demonstrations of practical activities are allowed in order to develop knowledge, understanding and skills and to identify health and safety issues relating to specific tools, equipment and processes.

Collaboration control

Where group-work occurs, evidence of individual contributions must be clearly identified and recorded.

Resources

Access to resources is determined by those available to the centre.

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Assessment criteria

Section	Sub-section	Marks	Level of response	Mark range
Use information (6 marks)	a) Read and interpret a product specification and engineering drawings/ diagrams	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> With support and guidance, use of some information within a product specification and interpretation of basic details in engineering drawings and/or diagrams. 	1–2
			<ul style="list-style-type: none"> With limited support and guidance, use of the main information within a product specification and interpretation of the main details in engineering drawings and diagrams. 	3–4
			<ul style="list-style-type: none"> Independent and confident use of the main information within a product specification and competent interpretation of the main details in engineering drawings and diagrams. 	5–6

Section	Sub-section	Marks	Level of response	Mark range
Plan (12 marks)	b) Produce a production plan which includes information about resources and processing requirements*	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> With support and guidance, produce a production plan that identifies basic details of resources and processing requirements. Production plan includes frequent errors in spelling and grammar. Terminology is not be used accurately or appropriately. 	1-2
			<ul style="list-style-type: none"> With limited support and guidance, produce a production plan that identifies the most important details of resources and processing requirements. Production plan is legible and includes a sound use of spelling and punctuation. Terminology is mostly used appropriately. 	3-4
			<ul style="list-style-type: none"> Independently produce a production plan that identifies fully the main details of the resources and processing requirements. Grammar, punctuation and spelling errors are unusual and there is good use of accurate terminology. 	5-6
	c) Produce a production plan which includes information about production details and constraints*	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> With support and guidance, produce a production plan that identifies basic details of production requirements and constraints. Production plan includes frequent errors in spelling and grammar. Terminology is not be used accurately or appropriately. 	1-2
			<ul style="list-style-type: none"> With limited support and guidance, produce a production plan that identifies the most important production requirements and constraints. Production plan is legible and includes a sound use of spelling and punctuation. Terminology is mostly used appropriately. 	3-4
			<ul style="list-style-type: none"> Independently produce a production plan that identifies fully the main details of production requirements and constraints. Grammar, punctuation and spelling errors are unusual and there is good use of accurate terminology 	5-6

Section	Sub-section	Marks	Level of response	Mark range
Make (26 marks)	d) Identify, prepare and use materials	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> Identify and prepare, with guidance, some appropriate materials, using them safely with some skill to make a product. 	1-2
			<ul style="list-style-type: none"> Identify and prepare, with limited guidance, appropriate materials, using them safely with skill to make a product. 	3-4
			<ul style="list-style-type: none"> Identify and independently prepare appropriate materials, using them safely with skill and accuracy to make a product. 	5-6
	e) Identify, prepare and use parts and components	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> With guidance and support, identify and prepare some appropriate parts and components, using them safely with some skill to make a product. 	1-2
			<ul style="list-style-type: none"> With limited guidance and support, identify and prepare appropriate parts and components, using them safely with skill to make a product. 	3-4
			<ul style="list-style-type: none"> Independently identify and prepare appropriate parts and components, using them safely with skill and accuracy to make a product. 	5-6
	f) Select and use processes, tools and equipment	8	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> Select and use, with guidance, some appropriate processes, tools and equipment, using them safely, with guidance and support, and exhibiting some skill to make a product. 	1-2
			<ul style="list-style-type: none"> Select and use, with limited guidance, appropriate processes, tools and equipment, using them safely with limited guidance and skill to make a product. 	3-5
			<ul style="list-style-type: none"> Independently select appropriate processes, tools and equipment, using them safely with skill and accuracy to make a product. 	6-8

Section	Sub-section	Marks	Level of response	Mark range
	g) Produce an engineered product	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> Production of an incomplete engineered product with some skill and accuracy. 	1-2
			<ul style="list-style-type: none"> Production of an engineered product that has been assembled and finished with skill, although there may be some aspects where accuracy or quality could still be improved upon. 	4-5
			<ul style="list-style-type: none"> Production of a high-quality engineered product that has been assembled and finished with a high level of skill and accuracy. 	5-6
Test (6 marks)	h) Testing and evaluation*	6	<ul style="list-style-type: none"> Level of response not worthy of credit. 	0
			<ul style="list-style-type: none"> Carry out basic testing against some aspects of the product specification and demonstrate that the product has limited compliance with the required standards. Written evidence is poorly presented with little use of appropriate terminology. 	1-2
			<ul style="list-style-type: none"> Carry out a range of testing against the product specification and demonstrate that the product complies with the main required standards. Written evidence is generally free of errors and terminology mostly used appropriately. 	3-4
			<ul style="list-style-type: none"> Carry out objective testing against the product specification and demonstrate that the product consistently complies with the required standards. Written evidence is clear, with consistent use of spelling or punctuation and grammar and there is good use of accurate terminology. 	5-6
Total marks:		50		50

* Opportunity for students to be assessed on quality of written communication.

Edexcel GCSE

Manufacturing (Double Award) (2MN02) Engineering (Double Award) (2EG02)

Unit 3: Application of Technology in Engineering and Manufacturing

Sample Assessment Material

Pre-release material
To be opened on receipt

Paper Reference

5EM03

You do not need any other materials.

Instructions to Candidates

This Pre-release material contains instructions for all **six** sectors.
Candidates should be entered for, study and select the research product from only **one** of these sectors.

Advice to Candidates

You may take your researched notes and sketches into the examination room and use these as reference materials. **None** of this material should be sent to Edexcel and Pre-release work will **not** be marked.

ALL the questions in Section B of the question paper will relate to your selected product.

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This Pre-Release contains the following sectors:

- Printing and Publishing, Paper and Board (5EM03/3A)
- Food and Drink, Biological and Chemical (5EM03/3B)
- Textiles and Clothing (5EM03/3C)
- Engineering Fabrication (5EM03/3D)
- Electrical and Electronics, Process Control, Computers, Telecommunications (5EM03/3E)
- Mechanical, Automotive (5EM03/3F)

Introduction

The examination for Unit 3 is offered as **six** different sector pathways. Centres are free to select which sector paper they wish to enter their candidates.

This pre-release consists of guidance for the candidates and notes to the centre. Staff at the centre should read the information for all six sectors before deciding which sector is most suitable for them to support the needs of their candidates.

Generally speaking Engineering is split into **three** sectors: Engineering Fabrication; Electrical and Electronics, Process Control, Computers, Telecommunications; and Mechanical, Automotive. Manufacturing is split into **three** sectors: Printing and Publishing, Paper and Board; Food and Drink, Biological and Chemical; and Textiles and Clothing. Regardless of the route the centre is planning for the other two units in the qualification, the sector for this unit can be chosen to suit the best support a centre can offer rather than being defined by any preconceived ideas.

Introduction to use this pre-release

The product selected by Edexcel for each of the sectors is a product that is in general use, easy to recognise and easy to obtain. Most of these products would be of a reasonable price to purchase or are already available or owned by centres.

Whilst the internet is a very valuable source of information, centres should not rely totally on this and may need to be diligent in their own research before deciding which sector is best for their candidates. For some sector products there may be a wealth of materials on the internet, such as food industry information. However, searching for manufacturers of traditional engineering type products may prove more difficult. Often adding the word 'manufacturer' when carrying out searches using 'advanced search tools' on search engines supplies better results than not entering, or using this word alongside the product name.

Supporting the candidates

After defining the sector specific paper, centres need to develop a support strategy for their students. They need to consider the local support that can be gained from either industry, colleges or even universities together with the information known to be available from the teacher's initial search and investigation to decide which sector paper to use.

In an area where manufacturer support for the exact product may be difficult to come by, the centre needs to source local support that uses similar processes and techniques to that found in almost any engineering manufacture. A typical way to support the candidates would be to visit the local company before the planned visit, establish what the company can show/offer, and then match or simulate this to the manufacturing process. Different groups of candidates could be asked to get information on a particular aspect on application of technology from the company visit and briefed to give feedback to the rest of the group on return back to the centre. The teacher's role would be to draw out the similarities between the technology seen and that of the product. Back at the centre the product should be made available and dismantled. Again the teacher should be able to relate what is required for the manufacture and application of technology from that seen on any visits to local companies.

Further support

The delivery of the vocational curriculum requires that centres support candidates in the context of their course by applying work related learning techniques to their area of study. Engineering and Manufacturing has the support of SEMTA and local SETPoints, as well as all other local support mechanisms, such as the Education Business Links Organisations (EBLO) and Work Related Learning Officers, either in schools or Local Authorities. Appropriate trade associations and professional bodies may also be useful sources of information. Often Vocational Learning Support Networks 14–16 are available and supported by the Learning & Skills Development Agency (LSDA).

Once the centre has facilitated the research required by the pre-release material and instructions, teachers should encourage the candidates to consider the usefulness of any materials gained. Often materials will be found on websites and centres need to ensure that the candidates print/copy only pages that are relevant to that required and defined by the pre-release. They should not print masses of web pages. If studied closely the pre-release highlights the areas of knowledge required for the examination and can become the focus for collecting information. Just like an internally assessed unit, the candidates should be encouraged to produce a portfolio of their research. This can then be taken into the examination and used by the candidates when answering the questions in the paper. The research notes and sketches therefore need to be well organised, or they may be more of a hindrance than help.

What not to do

Take into the examination more than their own research notes and sketches, such as practice or previous examination papers, or materials supplied by Edexcel as support materials. This often damages candidate opportunities when they give a very detailed answer, but fail to put their answer into context of the question being asked. Centres should think about their responsibility in this matter as candidates may be disadvantaged and not be awarded marks to match their potential.

Sector 1: Printing and Publishing, Paper and Board

The written examination paper is split into two sections.
Section A is worth 50 marks and Section B is worth 60 marks.

In **Section A** you will need to answer a range of general questions.

To prepare for Section A, you should study and understand the design and manufacture of a range of mass produced products belonging to and used in the *Printing and Publishing, Paper and Board* sector.

You should be able to:

- Name and identify products from this sector including appropriate uses and applications
- Identify a range of transportation and storage symbols often found on packaging and their uses
- Identify the stages in manufacturing products from this sector
- Name and understand the functions of modern materials used in products in this sector
- Identify, apply and evaluate new technologies including CAD/CAM, ICT, systems and control technology and CIM
- Know and understand the benefits new technology can have on a company relating to communications, control of production, automation and retailers
- Know how old technology has been replaced by new technology.

For **Section B** you should carry out research into the stages in manufacturing **mass produced wire-bound calendars**.



You should be able to:

- Identify the parts/components used in wire-bound calendars and explain their functions
- Name and explain the functions of modern materials and their impact on product characteristics
- Explain high volume printing processes used in manufacture and know about other processes used
- Name and describe the stages in manufacture
- Explain the impact of quality and computer control when used in design, production and packaging & dispatch
- Explain how ICT is used and impacts on the stages of manufacturing the wire-bound calendar
- Explain how new technologies impact on materials supply and control, the workforce and the working environment.

You should also familiarise yourself with the *Detailed unit content* section of the Edexcel GCSE in Manufacturing Specification – Unit 3: Application of Technology in Engineering and Manufacturing.

Sector 2: Food and Drink, Biological and Chemical

The written examination paper is split into two sections.
Section A is worth 50 marks and Section B is worth 60 marks.

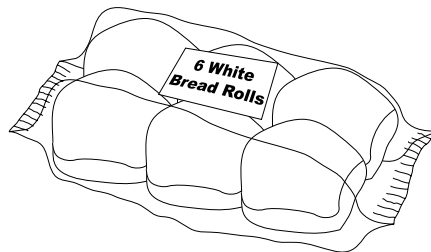
In **Section A** you will need to answer a range of general questions.

To prepare for Section A, you should study and understand the design and manufacture of a range of mass produced products belonging to and used in the *Food and Drink, Biological and Chemical* sector.

You should be able to:

- Name and identify products from this sector including appropriate uses and applications
- Identify a range of ingredients and materials used in the manufacture of food and drink, biological and chemical products and their uses
- Identify the stages in manufacturing products from this sector
- Name and understand the functions of modern materials used in products in this sector
- Identify, apply and evaluate new technologies including CAD/CAM, ICT, systems and control technology and CIM
- Know and understand the benefits new technology can have on a company relating to communications, control of production, automation, retailers and consumers
- Know how old technology has been replaced by new technology.

For **Section B** you should carry out research into the stages in manufacturing **mass produced packs of bread rolls**.



You should be able to:

- Identify the ingredients and raw materials used in packs of bread rolls and explain their functions
- Name and explain the functions of modern materials and their impact on product characteristics and the environment
- Explain and identify appropriate processes including mixing dough when manufacturing the product
- Name and describe the stages in manufacture
- Explain the purpose of packaging and labelling
- Explain the impact of quality and computer control when used in production and packaging and dispatch
- Explain how ICT is used and impacts on the stages of manufacturing the packs of bread rolls
- Explain how new technologies impact on ingredients and raw materials supply and control, the workforce and the working environment.

You should also familiarise yourself with the *Detailed unit content* section of the Edexcel GCSE in Manufacturing Specification – Unit 3: Application of Technology in Engineering and Manufacturing.

Sector 3: Textiles and Clothing

The written examination paper is split into two sections.
Section A is worth 50 marks and Section B is worth 60 marks.

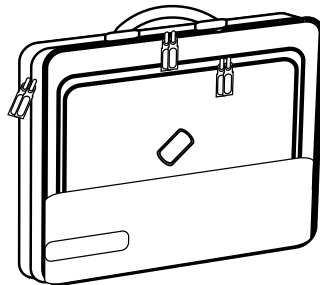
In **Section A** you will need to answer a range of general questions.

To prepare for Section A, you should study and understand the design and manufacture of a range of mass produced products belonging to and used in the *Textiles and Clothing* sector.

You should be able to:

- Name and identify products from this sector including appropriate uses and applications
- Identify a range of components used in the manufacture of textiles and clothing products and their uses
- Identify the stages in manufacturing products from this sector
- Name and understand the functions of modern materials used in products in this sector
- Identify, apply and evaluate new technologies including CAD/CAM, ICT, systems and control technology and CIM
- Know and understand the benefits new technology can have on a company relating to communications, control of production, automation, distributors and consumers
- Know how old technology has been replaced by new technology.

For **Section B** you should carry out research into the stages in manufacturing **mass produced laptop cases**.



You should be able to:

- Identify the parts/components used in laptop cases and explain their functions
- Name and explain the functions of modern materials and their impact on product characteristics and the environment
- Explain and identify appropriate processes including machining and finishing when manufacturing the product
- Name and describe the stages in manufacture
- Explain the impact of quality and computer control when used in production and packaging & dispatch
- Explain how ICT is used and impacts on the stages of manufacturing the laptop cases
- Explain how new technologies impact on materials supply and control, the workforce and the working environment.

You should also familiarise yourself with the *Detailed unit content* section of the Edexcel GCSE in Manufacturing Specification – Unit 3: Application of Technology in Engineering and Manufacturing.

Sector 4: Engineering Fabrication

The written examination paper is split into two sections.
Section A is worth 50 marks and Section B is worth 60 marks.

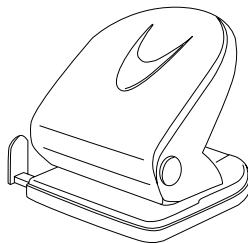
In **Section A** you will need to answer a range of general questions.

To prepare for Section A, you should study and understand the design and manufacture of a range of mass produced products belonging to and used in the *Engineering Fabrication* sector.

You should be able to:

- Name and identify products from this sector including appropriate uses and applications
- Identify a range of components used in the manufacture of engineering products and their uses
- Identify the stages in manufacturing products from this sector
- Name and understand the functions of modern materials used in products in this sector
- Identify, apply and evaluate new technologies including CAD/CAM, ICT, systems and control technology and CIM
- Know and understand the benefits new technology can have on a company relating to communications, control of production, automation, distributors and consumers
- Know how old technology has been replaced by new technology.

For **Section B** you should carry out research into the stages in manufacturing **mass produced paper hole punches**.



You should be able to:

- Identify the parts/components used in paper hole punches and explain their functions
- Name and explain the functions of modern materials and their impact on product characteristics and the environment
- Explain and identify appropriate processes including moulding and forming when manufacturing the product
- Name and describe the stages in manufacture
- Understand and explain the principles and applications of quality control
- Explain the impact of quality and computer control when used in production and packaging & dispatch
- Explain how ICT is used and impacts on the stages of manufacturing the paper hole punch
- Explain how new technologies impact on materials supply and control, the workforce and the working environment.

You should also familiarise yourself with the *Detailed unit content* section of the Edexcel GCSE in Engineering Specification – Unit 3: Application of Technology in Engineering and Manufacturing.

Sector 5: Electrical and Electronics, Process Control, Computers, Telecommunications

The written examination paper is split into two sections.
Section A is worth 50 marks and Section B is worth 60 marks.

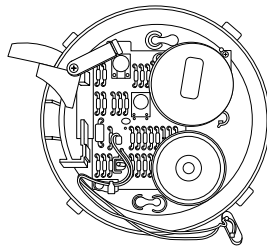
In **Section A** you will need to answer a range of general questions.

To prepare for Section A, you should study and understand the design and manufacture of a range of mass produced products belonging to and used in the *Electrical and Electronics, Process Control, Computers, Telecommunications* sector.

You should be able to:

- Name and identify products from this sector including appropriate uses and applications
- Identify a range of components used in the manufacture of *Electrical and Electronics, Process, Control, Computers, Telecommunications* products and their uses
- Identify the stages in manufacturing products from this sector
- Name and understand the functions of modern materials used in products in this sector
- Identify, apply and evaluate new technologies including CAD/CAM, ICT, systems and control technology and CIM
- Know and understand the benefits new technology can have on a company relating to communications, control of production, automation, distributors and consumers
- Know how old technology has been replaced by new technology.

For **Section B** you should carry out research into the stages in manufacturing **mass produced domestic smoke alarms**.



You should be able to:

- Identify the parts/components used in domestic smoke alarms and explain their functions
- Name and explain the functions of modern materials and their impact on product characteristics and the environment
- Explain and identify appropriate processes including injection moulding when manufacturing the product
- Name and describe the stages in manufacture
- Explain the impact of quality and computer control when used in production and packaging & dispatch
- Explain how ICT is used and impacts on the stages of manufacturing the domestic smoke alarms
- Explain how new technologies impact on materials supply and control, the workforce and the working environment.

You should also familiarise yourself with the *Detailed unit content* section of the Edexcel GCSE in Engineering Specification – Unit 3: Application of Technology in Engineering and Manufacturing.

Sector 6: Mechanical, Automotive

The written examination paper is split into two sections.
Section A is worth 50 marks and Section B is worth 60 marks.

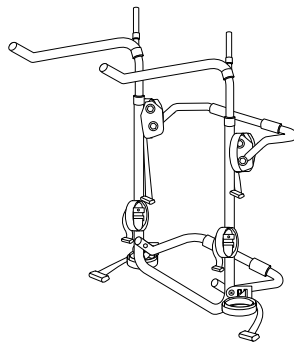
In **Section A** you will need to answer a range of general questions.

To prepare for Section A, you should study and understand the design and manufacture of a range of mass produced products belonging to and used in the *Mechanical, Automotive* sector.

You should be able to:

- Name and identify products from this sector including appropriate uses and applications
- Identify a range of components used in the manufacture of engineering products and their uses
- Identify the stages in manufacturing products from this sector
- Name and understand the functions of modern materials used in products in this sector
- Identify, apply and evaluate new technologies including CAD/CAM, ICT, systems and control technology and CIM
- Know and understand the benefits new technology can have on a company relating to communications, control of production, automation, distributors and consumers
- Know how old technology has been replaced by new technology.

For **Section B** you should carry out research into the stages in manufacturing **mass produced cycle carriers**.



You should be able to:

- Identify the parts/components used in cycle carriers and explain their functions
- Name and explain the functions of modern materials and their impact on product characteristics and the environment
- Explain and identify appropriate processes including extrusion and polymer coating when manufacturing the product
- Name and describe the stages in manufacture
- Explain the impact of quality and computer control when used in production and packaging & dispatch
- Explain how ICT is used and impacts on the stages of manufacturing the cycle carrier
- Explain how new technologies impact on materials supply and control, the workforce and the working environment.

You should also familiarise yourself with the *Detailed unit content* section of the Edexcel GCSE in Engineering Specification – Unit 3: Application of Technology in Engineering and Manufacturing.

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Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

**Manufacturing (Double Award)
Engineering (Double Award)**

**Unit 3A: Application of Technology in Engineering and Manufacturing
Paper 1: Printing and Publishing, Paper and Board**

Sample Assessment Material

Time: 1 hour 30 minutes

Paper Reference

5EM03/3A

You must have:

Notes and sketches collected during your Pre-release research.
Ruler, Pen, Pencil, Rubber.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** the questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The question labelled with an **asterisk** (*) is where the quality of your written communication will be assessed.
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on this question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A

Answer ALL questions.

Question 1 must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 All of the products listed below belong to a manufacturing sector.

(a) Put a cross in the **two** boxes below where the products belong to the **printing and publishing** sector.

(2)

Products	Put a cross in two boxes below
Sun-tan lotion	<input type="checkbox"/>
Door handles	<input type="checkbox"/>
Calculator	<input type="checkbox"/>
Modular climbing frames	<input type="checkbox"/>
Street maps	<input type="checkbox"/>
Football shin pads	<input type="checkbox"/>

(b) Put a cross in the **two** boxes below where the products belong to the **paper and board** sector.

(2)

Products	Put a cross in two boxes below
Filing cabinets	<input type="checkbox"/>
Mouthwash	<input type="checkbox"/>
Fuel injection systems	<input type="checkbox"/>
Shopping trolley	<input type="checkbox"/>
High energy snack bar	<input type="checkbox"/>
Leather wallet	<input type="checkbox"/>



(Total for Question 1 = 4 marks)

2 The tables below show some symbols often seen on packaging.

(a) Complete Table 1 by naming each symbol.

(2)


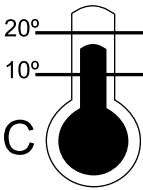
Table 1

Symbol	Symbol name	Meaning
		Tells those handling the package that it must be carried and stored in a particular manner.
		Tells those handling the package that it must be carried and stored with care.

(b) Complete Table 2 by explaining the meaning of each symbol.

(4)

Table 2

Symbol	Symbol name	Meaning
	Keep away from sunlight	
	Thermometer	

(Total for Question 2 = 6 marks)

3 Draw a straight line to link each **Term** listed below to the correct **Key Area**.

Each Key Area can be used more than once.

Term

Key Area

Preservative

Modern materials

Computer-integrated
manufacture (CIM)

Internet sites

Control technology

Stabiliser

Modified starch

Information
and Communications
Technology (ICT)

Process control

Spreadsheets

(Total for Question 3 = 7 marks)

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4 Wire-bound calendars belong to the printing and publishing, paper and board sector.

(a) Name **one** other product from this sector, apart from a wire-bound calendar that utilises control technology and modern materials in its manufacture.

(1)

.....
.....

(b) (i) State **one** modern material used in the manufacture of the product you named in 4(a).

(1)

.....
.....

(ii) Explain **two** benefits to the **manufacturer** of using this material.

(4)

1

.....
.....

2

.....
.....

(c) (i) State **one** type of control technology used in manufacturing.

(1)

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.....

(ii) Explain **one advantage** to the **manufacturer** of using control technology. (2)

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(iii) Explain **one disadvantage** to the **manufacturer** of using control technology. (2)

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(Total for Question 4 = 11 marks)

5 Computer-aided design (CAD) and Computer-aided manufacture (CAM) are both used by manufacturers of paper and board products.

(a) Describe **one** use of CAM when manufacturing products.

(2)

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(b) (i) State **two** benefits to the **retailer** of using CAM when manufacturing.

(2)

1

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2

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(ii) Explain **two** benefits to a **manufacturer** of using CAD.

(4)

1

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2

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(Total for Question 5 = 8 marks)

6 Communications technologies are widely used by manufacturers.

(a) Explain the term **communications technology**. (2)

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(b) Mobile phones and email are examples of communications technologies.

(i) Name **one** other example of communications technology. (1)

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(ii) Name the traditional communications method this has replaced. (1)

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.....

(iii) Explain **one advantage** to the **manufacturer** of using this replacement communications technology. (2)

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(iv) Explain **one disadvantage** to the **manufacturer** of using the replacement communications technology. (2)

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(Total for Question 6 = 8 marks)

7 Computer-integrated manufacturing systems (CIM) are used in the manufacture of paper and board products.

(a) Describe **one** main feature of a CIM system.

(2)

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(b) Explain **two** benefits to the **manufacturer** of using CIM in the production of paper and board products.

(4)

1

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2

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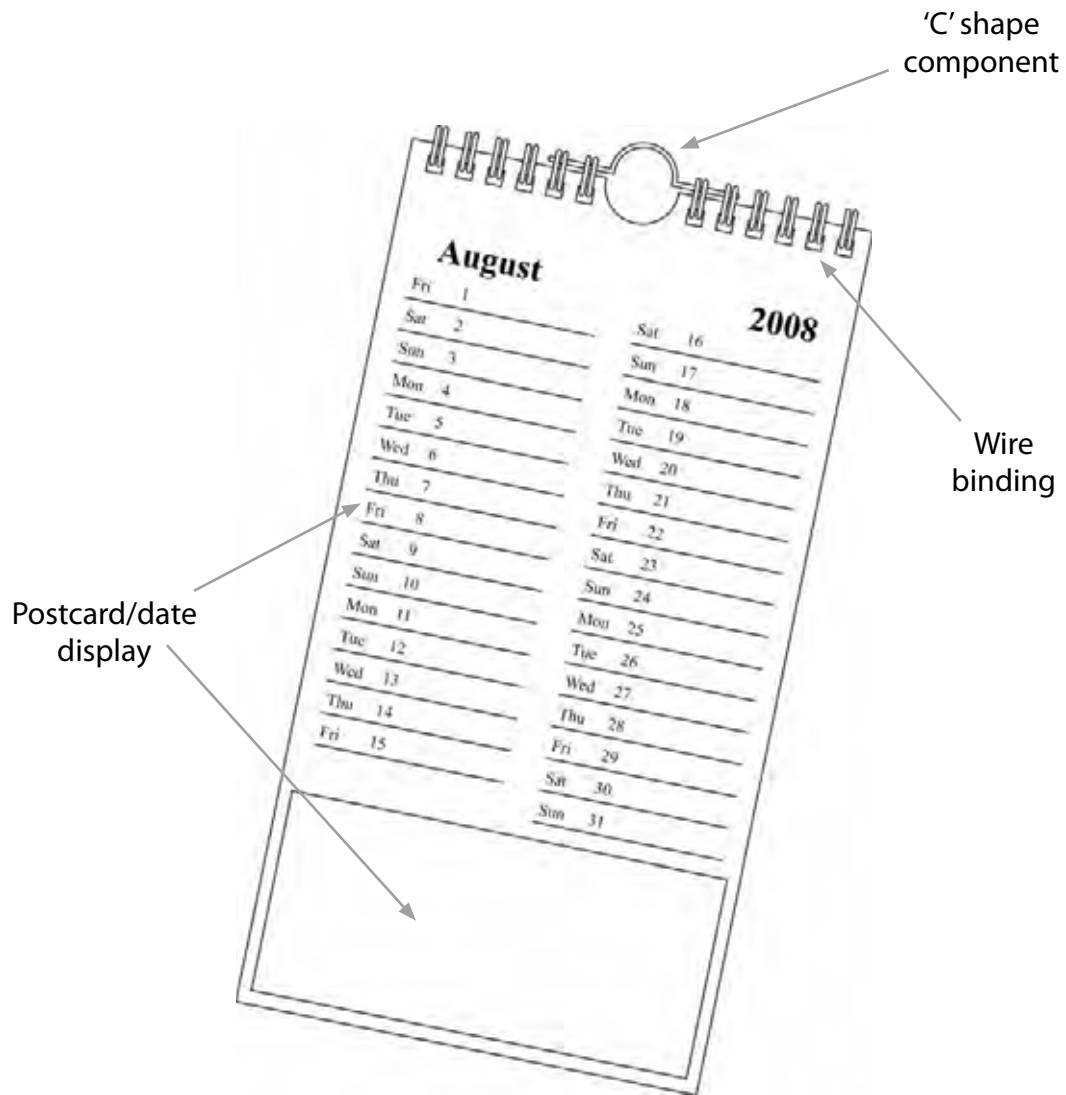
(Total for Question 7 = 6 marks)

TOTAL FOR SECTION A = 50 MARKS

SECTION B

Answer ALL questions in Section B with reference to the manufacture of mass produced wire-bound calendars.

The diagram below shows a **wire-bound calendar**.



8 Describe, using notes and sketches:

(a) the function of the 'C' shape component.

(3)

'C' shape component

(b) the function of the postcard/date display.

(3)

Postcard/date display

(c) the function of the wire binding.

(3)

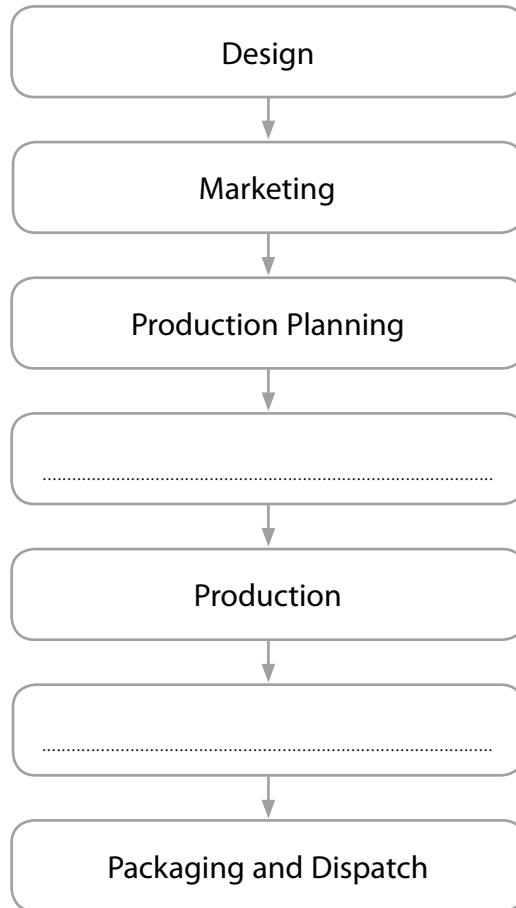
Wire binding

(Total for Question 8 = 9 marks)

9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing the wire-bound calendar.

(i) Complete the flow diagram by writing the **two** missing main stages in manufacturing wire-bound calendars.

(2)



(ii) State the stage where the postcard/date display is printed.

(1)

Stage

(b) Describe the following **two** stages in the manufacture of wire-bound calendars.

(i) Design

(3)

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(ii) Production Planning

(3)

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(Total for Question 9 = 9 marks)

10 Certain materials are used in the manufacture of the wire-bound calendar.

(a) (i) Apart from steel, state a specific material commonly used for the wire-bound calendar.

(1)

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(ii) Explain why steel is an appropriate material for the 'C' shape component and wire binding on the calendar.

(2)

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(b) Explain why web-fed offset lithography is a suitable process for printing the postcard/date display of the wire-bound calendar.

(2)

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.....

(c) State **two** production processes, other than web-fed offset lithography, used in the manufacture of wire-bound calendars.

(2)

1

2

(d) Explain how the use of modern materials has made wire-bound calendars appeal to consumers.

(3)

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(Total for Question 10 = 10 marks)

11 Quality control is used in the manufacture of wire-bound calendars.

(a) Explain the term **quality control**.

(2)

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(b) (i) Describe **one** quality control procedure used at the **production** stage of the manufacture of wire-bound calendars.

(2)

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(ii) Explain **one** benefit to the **manufacturer** of applying the type of quality control procedure named in (b)(i).

(2)

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(iii) Explain **one** benefit to the **consumer** of applying the type of quality control procedure named in (b)(i).

(2)

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(c) Explain the difference between open-loop and closed-loop quality control systems. (4)

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(Total for Question 11 = 12 marks)

12 Information and communications technology (ICT) plays an important role in the manufacture of wire-bound calendars.

(a) (i) Describe **one** use of ICT at the **design** stage when manufacturing wire-bound calendars.

(2)

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(ii) State **two** benefits of the use of ICT at the **design** stage.

(2)

1

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2

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(b) (i) Describe **one** use of computer control in the **packaging and dispatch** stage of manufacturing the wire-bound calendar.

(2)

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(ii) Explain **two** advantages of using computer control at the **packaging and dispatch** stage.

(4)

1

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2

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(Total for Question 12 = 10 marks)

13 Systems and control technology are used in modern printing and publishing processes.

Referring to both advantages and disadvantages, evaluate the effect of the use of systems and control technology on **materials supply and control**.

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(Total for Question 13 = 4 marks)

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Sample Mark Scheme

Paper 1: Printing and Publishing, Paper and Board

Section A

Question Number	Answer	Mark
1(a)	<ul style="list-style-type: none"> • Comb binders • Street maps <p>If 3 boxes or more ticked no marks.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
1(b)	<ul style="list-style-type: none"> • Juice carton • Shoe box <p>If 3 boxes or more ticked no marks.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none"> • This way up (accept any answer that makes reference to keeping the package upright) eg keep upright <p>Do not accept any repetition of the statements from the 'meaning' box on the question paper, i.e. 'Tells those handling the package that it must be carried and stored in a particular manner.'</p> <p style="text-align: right;">(1 x 1)</p>	(2)
	<ul style="list-style-type: none"> • Fragile (accept any answer that makes reference to the product inside being fragile) eg easily broken <p>Do not accept any repetition of the statements from the 'meaning' box on the question paper, i.e. 'Tells those handling the package that it must be carried and stored with care.'</p> <p style="text-align: right;">(1 x 1)</p>	

Question Number	Answer	Mark
2(b)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • sunlight could damage the product • exposure to sunlight may be dangerous • do not open the package in sunlight • store out of sunlight • transport out of sunlight <p>eg sunlight could damage the product inside the package (1) so it must be transported (1) and stored away from sunlight (1). Up to a maximum of 2 marks.</p> <p>Do not accept any repetition of the statement from the 'symbol name' box on the question paper, i.e. 'Keep away from sunlight'</p> <p style="text-align: right;">(2 x 1)</p> <hr/> <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • exposure to temperatures outside the range could spoil the product • found mainly on packages containing food and drink • contents should be stored at a temperature between ten and twenty degrees centigrade • contents should be transported at a temperature between ten and twenty degrees centigrade <p>eg this symbol is found on food packaging (1) and shows that the product needs to be stored (1) and transported between 10 and 20 degrees centigrade (1). Up to a maximum of 2 marks.</p> <p>Do not accept any repetition of the statement from the 'symbol name' box on the question paper, i.e. 'Thermometer'</p> <p style="text-align: right;">(2 x 1)</p>	(4)

Question Number	Answer	Mark
3	<p>No mark awarded where 2 or more lines are drawn from a term. Lines do not have to be straight but term and key area must be clearly linked.</p> <ul style="list-style-type: none"> • Laminate = Modern materials • Computer Integrated Manufacture (CIM) = Control technology • Internet Sites = Information & Communications Technology (ICT) • Polymorph = Modern materials • Bleed proof paper = Modern materials • Process control = Control technology • Spreadsheets = Information & Communications Technology (ICT) <p style="text-align: right;">(7 x 1)</p>	(7)

Question Number	Answer	Mark
4(a)	<p>Appropriate product eg</p> <ul style="list-style-type: none"> • Backing board • Blister packaging • Tickets • CD/DVD booklet • Forehead thermometer • Greeting card • Business card • Paperback book • Point of sale display • Board game • Tetrapak • A brand name of a specific product <p>Do not accept 'card'.</p> <p>This list is not exhaustive; accept any product associated with the printing and publishing paper and board sector.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(i)	<ul style="list-style-type: none"> • Thermo-chromic inks • Phosphorescent pigments • Polymorph • Laminate • Holographic card • Packaging laminates • Coated card • Bleed proof card • Various thermoplastics (PP, HDPE, PVC etc) • Other appropriate materials/a material currently used for the given application <p>Accept 'card', 'cardboard' or 'thermoplastic'</p> <p>If product given in 4(a) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through.</p> <p>No answer to 4(a) no marks for 4(b)(i).</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>One mark for identifying each benefit One mark for each explanation</p> <ul style="list-style-type: none"> • Better functional characteristics (1) - weight (1)/size (1)/shelf life (1)/protection (1)/rigidity (1) • Better mechanical characteristics (1) - strength (1)/durability (1) • Better aesthetic characteristics (1) - surface finish (1)/texture (1)/colour (1)/appearance (1) • Meets requirements of intended markets (1) - appeal to target audience (1) • Better quality standards (1) - consistency (1)/reliability (1) • Reduced weight (1) - better strength to weight ratio (1) • Reduced cost (1) - quicker/quicker to assemble (1) • Any other appropriate functional/mechanical/aesthetic characteristic relating to the benefit (1) <p>If answer in part 4a is inappropriate but the material given in 4b(i) is appropriate allow follow through up to 2 marks for each of the two benefits. If no answer is given in part 4a but the answer to part 4b(ii) relates to the material stated in part 4b(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4b(i) no marks awarded for 4b(ii).</p> <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
4(c)(i)	<ul style="list-style-type: none"> • Process control • Quality control • PLCs • Embedded computers • Robotics • Sensors • Computer control of CNC Machinery <p>No marks for 'Automation'</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(c)(ii)	<p>One mark for identifying advantage One mark for why</p> <p>Appropriate advantage to the manufacturer, eg production planning</p> <ul style="list-style-type: none"> • speed (1) - faster than human application (1) <p>materials - supply and control</p> <ul style="list-style-type: none"> • cost control (1) - by less waste/faulty parts (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p>processing/production</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • competitiveness (1) - faster rates of production (1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>assembly/finishing</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>packaging/dispatch</p> <ul style="list-style-type: none"> • packaging consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
4(c)(iii)	<p>One mark for identifying disadvantage One mark for why</p> <p>Appropriate disadvantage to the manufacturer, eg</p> <ul style="list-style-type: none"> • High initial set up costs (1) - time taken to program and test operations (1) • High cost of machinery and equipment (1) - initial outlay must be recouped before profit (1) • High maintenance costs (1) - time consuming and skilled due to nature of technology (1) • Machine downtime expensive (1) - lost production or slower throughput (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(a)	<p>One mark for identifying the use One mark for the description</p> <ul style="list-style-type: none"> • materials supply (1)/purchasing (generating orders) (1) • materials control (MRP1 (1), automatic material issuing) (1) • stages in production/processing (1) vacuum forming/die cutting etc. (1) • process control (1) data logging (1) • storage (1) automated warehouse (1) • distribution (1) automatic order picking (1) • packaging (1) automatic labelling (1) • or other appropriate <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(i)	<p>One mark for identifying each benefit up to a maximum of two</p> <ul style="list-style-type: none"> • More consistent products (1) • fewer returns (1) • lower purchase price (1) • shorter order times (1) • automated ordering (1) • ability to order bespoke/varied products (1) • better communication with manufacturer (1) • receipt and movement of goods inward improved (1) • improved customer satisfaction (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(ii)	<p>One mark for identifying each benefit One mark for each explanation</p> <ul style="list-style-type: none"> • Conversion from 2D to 3D (1) for modelling (1) • Quicker development time (1) through simulation (1) • Easy to make modifications/edit/change (1) no paper hard copies (1)/computer data (1) • Lower initial development costs (1) concurrent design processes (1) • Easy storage of data/information and retrieval (1) interaction with databases (1) • Accurately drawn (1) entry of accurate data or sizes (co-ordinates) (1) <p>Do not accept 'easier' without explanation (4 x 1)</p>	(4)

Question Number	Answer	Mark
6(a)	<p>The application of technology to transfer/manipulate information (1) from/around one source to another (1). (2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(i)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • infrared/bluetooth • messaging • Internet/wireless/Wi-fi • Video conferencing • Electronic point of sale (EPOS) • EDI • ISDN • Texting • Phone • Walkie talkie • Fax <p>Do not accept: TV, CAD, radio, computer/laptop/database or mobile phones/email (as in question) (1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(ii)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Books, journals, buyers guides, catalogues, brochures • Video conferencing - travel to central location • Electronic point of sale (EPOS) - stock taking, manual ordering, income calculations • EDI - postal documents • ISDN - analogue transmission • Texting - phone/conversation • Phone - telegrams • Fax - letters/memos/post <p>1 mark for relevant example which must relate to the technology given in 6(b)(i). If part 6(b)(i) not answered no mark awarded.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(iii)	<p>One mark for identifying the advantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - flexibility (1)/roaming location (1)/cost (1) • Internet - immediate (1)/access to vast amount of information (1) • Video conferencing - no travel expenses (1)/less time wasted in travelling (1) • Electronic point of sale (EPOS) - faster (1)/more accurate (1) • EDI - immediate transfer of information (1)/no hard copies needed (1)/less storage space (1) • ISDN - more data transferred in parallel (1), quicker/easier (1) • Texting - stored record of transaction (1), quicker/easier (1) • Phone - immediate two way conversation (1) quicker/easier (1) • Fax - hard copy record (1), quick transfer data (1) <p>Other advantages may be seen in the light of: speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced stock levels, reduced running costs, reduced lead times, calculation of sales, storage space reduced or any other appropriate response.</p> <p>Advantages must relate to the manufacturer.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(iv)	<p>One mark for identifying the disadvantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - poor quality (1) if out of range (1) • Internet - can be slow (1) when very busy (1) • Video conferencing - can be unreliable (1) signal quality can be poor (1) • Electronic point of sale (EPOS) - can be unreliable (1) sometimes does not recognise codes (1) • EDI - cost (1) of installing new equipment (1) • ISDN - cost (1) installing new line/equipment (1) • Texting - limited service (1) cannot send large data files (1) • Phone - communication not always private (1) crossed lines/phone tapping (1) • Fax - information fades (1) if not copied (1) <p>Any other appropriate response. Disadvantages must relate to the manufacturer. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(a)	<p>Appropriate description of CIM up to two marks such as:</p> <ul style="list-style-type: none"> • CIM is a method of manufacturing in which the entire production process (1) is controlled by computer (1) • CIM integrates (1) the use of all different functions of computers (1) in a company • CIM uses a flexible design and manufacturing system (1) where the factory can be quickly changed to produce different products (1) • Uses Product Development Management (PDM) systems (1) to manage concurrent design and manufacture (1) • Involves the use of CAD, CAM, modelling and simulation, sensors (1) in manufacturing control, CAD/CAM, automation and robotics (1) <p>Any other appropriate response. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(b)	<p>One mark for identifying the benefit One mark for explanation</p> <ul style="list-style-type: none"> • Fast and efficient (1) cost effective manufacturing (1) • Concurrent manufacturing (1) faster time to market (1) • Efficient management of overall process (1) such as design/development, production planning, QC, materials supply & control (1) • Good communication links (1) between product development/production teams/suppliers and retailers (1) • Easy access to technical data/organisational information (1) by design and/or production team (1) • Reduction in product time to market (1) using JIT (1) <p>Any other appropriate response.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Section B

Question Number	Answer	Mark
8(a)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To allow the calendar to be hung on a door or wall • To allow the date display to be written on whilst hung on the door/wall • To allow the calendar to be hung over hooks/pins etc. of different shapes and sizes • To allow 360 degree operation of the postcard/date display • To enable the calendar to show one month at a time (for ease of use, to minimise size etc.) • Or similar <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used.</p> <p style="text-align: right;">(3 x 1)</p>	(3)

Question Number	Answer	Mark
8(b)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • Date display - to provide information regarding the day/date/month etc. • Date display - to provide a method for the user to note key dates (diary function) • Date display - to advertise a company or organisation • Postcard - to promote purchase by providing extra feature • Postcard - secondary use, possibly when calendar out of date • To provide an edge that can be punched for the wire binding • Full colour printing possible • Printing effects possible • Or similar <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used.</p> <p style="text-align: right;">(3 x 1)</p>	(3)

Question Number	Answer	Mark
8(c)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To bind the 12 separate postcard/date displays • To provide a firm binding method for durability • Allows use of material with greater density and thickness for postcard/date displays (for durability) • To allow 360 degree operation of the postcard/date displays • Offers perfect page registration of postcard/date displays • Postcard/date displays can lie flat and pages turn easily • Permanent method to prevent the insertion of new pages • To allow the 'C' shape component to operate effectively • Or similar <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> • Materials supply and control/materials supply/materials control • Assembly and finishing/assembly/finishing <p>Must be in this order. (2 x 1)</p>	(2)

Question Number	Answer	Mark
9(a)(ii)	<ul style="list-style-type: none"> • Production/processing • Stage 5/stage five • 5/five <p>(1 x 1)</p>	(1)

Question Number	Answer	Mark
9(b)(i)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Development of the design brief (1) • Design specification for the wire-bound calendar (1) • Listing design criteria (1) • Listing performance requirements (1) • Development of design ideas (1) • Modelling ideas using ICT (1) • Initial design ideas are produced (1) • Using CAD software (1) • Sketches are produced (1) by hand • Modelling ideas (1) • Prototyping before manufacture (1) • Or similar <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the design brief for the wire-bound calendar would be developed (1), and where designs would be created (1) by hand and using CAD software (1), in order to model the product prior to manufacture (1) (up to a maximum of 3 marks).</p>	(3)

Question Number	Answer	Mark
9(b)(ii)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Scheduling production (1) • Converting order to production (1) • Materials requirements (1) • Labour requirements (1) • Deadlines (1) • Throughputs (1) • Machinery/equipment requirements (1) • Quality checks (1) • Control points (1) • Health and safety (1) • Any other appropriate response <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the manufacturer decides how the product is going to be made (1), what materials are needed (1) and what processes will be used during manufacturing (1).</p>	(3)

Question Number	Answer	Mark
10(a)(i)	<p>Specific materials used for the wire-bound calendar</p> <ul style="list-style-type: none"> • Cardboard • Duplex Board • Solid white board • Cast-coated board • Any other appropriate, inc. finishing materials, i.e. varnish <p>Do not accept generic answers, i.e. 'board', 'card', 'paper'</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
10(a)(ii)	<p>One mark for improvement One mark for how</p> <ul style="list-style-type: none"> • Wear resistance (1) for durability (1) • Strength (1) to resist forces when in use (1) • Can use thinner gauge material (1) to reduce weight (1) and cost (1) • Can be sprayed different colours (1) to improve presentation (1) • Can be bent or shaped (1) to suit function of part or component (1) • Any other appropriate <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(b)	<p>Appropriate explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • quick method/fast production rate • excellent print quality • prints four or more colours (CMYK) on a range of flat materials • aluminium printing plates are durable and can be replaced infrequently • unit costs are low for medium to high volume print runs • highly automated process • reliable process • minimal waste • not labour intensive • or similar <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(c)	<p>Any two of the following:</p> <ul style="list-style-type: none"> • die cutting • punching • perforating • plotter cutting • wire drawing • annealing/normalising • bending • wire forming • painting/powder coating • any other appropriate, inc. finishing processes <p>Do not accept generic answers, i.e. 'cutting' One mark per response up to two</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(d)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • improved aesthetics • higher quality printing • better ergonomics • better functionality • longer lasting/durable • more consistent product • more accurate product • more reliable product • safer product • lower purchase price • allows for product guarantee • allows for increased range/variation of product • lighter product • appropriate-sized product • or similar <p style="text-align: right;">(3 x 1)</p> <p>eg the use of modern materials has made wire-bound calendars more durable (1) as they are now non-absorbent (1) and as a result will resist spills (1).</p>	(3)

Question Number	Answer	Mark
11(a)	<p>Systems/processes/methods (1) used to ensure that products or services are designed and produced to meet or exceed customer requirements (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(i)	<p>One mark for identifying QC procedure One mark for how</p> <ul style="list-style-type: none"> • check physical damage -by visual inspection (1) and checking against prototype/first-off/template etc. (1) • size checks - by direct measurement or gauging/templates/optical sensors (1) and checking against drawing/specification/tolerances (1) • functional checks - assembly of wire binding/wire hanger/postcard-date display (1) and 360 degree operation of postcard/date display (1) • positional checks - use of crop marks (1) and target or registration marks for date display (1) • dimensional checks - use of co-ordinate measuring machine (1) and analysing reported data (1) • printing checks - use of colour bar (1) or densitometer readings (1) • properties testing - in system testing (1) or destructive testing of final product (1) • use of control charts (1) for statistical process control (1) • reference to BS/EN/ISO documentation (1) to comply with external standards (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(ii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Reduced customer complaints (1) - better products (1) • Control of costs (1) - cheaper product/more profit (1) • Avoids faulty parts being assembled (1) - early detection (1) • Increased sales (1) - consistent products/lower prices (1) • User confidence (1) - consistent product/less returns (1) • Reduced waste (1) - control of manufacturing process (1) • Made to same quality standard (1) - less chance of legal redress (1) • Reliable product (1) - monitoring standards testing/parts (1) • Safe (1) and easy to use (1) • No breaking parts (1) - monitoring of component/parts (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark.</p>	(2)

Question Number	Answer	Mark
11(b)(iii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Safer product to use (1) - confidence in product reliability (1) • Consistent product (1) - ensures standards are met (1) • Longer useable life (1) - don't have to buy so often (1) • Product reliability (1) - confidence in the company (1) • Lower prices (1) - less scrap/waste/more efficient (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark.</p>	(2)

Question Number	Answer	Mark
11(c)	<p>References to both open and closed systems required</p> <ul style="list-style-type: none"> • Open loop - does not use feedback to check the quality of the system • Open Loop - does not use feedback to determine if the input has achieved the desired goal • Open Loop - used in simple processes where low cost is important and feedback is not essential • Closed loop - uses feedback in order to make decisions about necessary changes • Closed loop - respond to changes as a result of feedback • Closed loop - used where greater accuracy and quicker response times are required <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
12(a)(i)	<p>One mark for the description One mark for how</p> <p>Description of use of ICT such as:</p> <ul style="list-style-type: none"> • Word processing of reports (1) during product development to aid evaluative process (1) • Using 2D/3D modelling techniques to design and modify the wire-bound calendar (1) and calculate quantity of materials required for manufacture (1) • Storage of information (1) of range of types of wire stitching/wire hangers/date displays (1) and interaction with databases and/or spreadsheets(1) • Use CAD modelling (1) of components (1) for different shapes/method of assembly (1) • Use of websites/internet to investigate existing designs (1) in order to create and modify design ideas (1) or to source materials/supplies/consumables (1) • Producing drawings (1) of component parts (1) and assembly of wire-bound calendars (1) • Presenting virtual products to clients (1) via presentation software (1) • Making accurate working drawings (1) and manufacturing specifications (1) • Produce cutting lists (1) for a range of sizes (1) • To communicate with/send CAD information to client via email (1) for approval (1) • Or similar <p style="text-align: right;">(2 x 1)</p> <p>Accept any appropriate software, eg Pro Desktop, 2D Design. No type of ICT named - no marks.</p>	(2)

Question Number	Answer	Mark
12(a)(ii)	<p>Answer that includes two of the following points:</p> <ul style="list-style-type: none"> • Product information available for the whole design team • Speed and efficiency of modelling and modification of ideas • Ease/speed of creating virtual products on screen • Speed of decision making by client • Easy access to existing components in company database • Efficiency of costing materials and using lay plans that minimise waste • Or similar <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(i)	<p>One mark for identifying the use One mark for how</p> <ul style="list-style-type: none"> • Use of bar coding (1) to monitor packaging/dispatch of wire-bound calendars (1) • Labelling systems (1) to electronically tag wire-bound calendars (1) • Automation processes (1) to assist with multi-product packaging and sealing (1) • Robotics (1) to transport products to dispatch areas (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(ii)	<p>One mark for identifying the advantage One mark for how</p> <ul style="list-style-type: none"> • Fast time to market (1) - automated systems (1) • Ease of tracking products (1) during delivery (1) • Ease of tracking products (1) on the premises (1) • Less manual labour required (1) - reduced labour cost • Robots can transport heavy items (1) - logistically easier or safer (1) • Reliability of tracking systems (1) - less returns (1) • Any other appropriate response <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
13	<p>An evaluation that makes reference to a combination of four of the following advantages and disadvantages to a maximum of four marks:</p> <p>Possible advantages:</p> <ul style="list-style-type: none"> • Reduced lead times (1) • Orders materials (1) • More choice available (1) • New technologies and materials create demand from innovative customers (1) • Control of stock levels easier and more accurate (1) • Just-in-time supply can be managed (JIT) (1) • Superior quality product produced (1) • Any other appropriate response <p>Possible disadvantages:</p> <ul style="list-style-type: none"> • Old design products become obsolete quicker (1) • Staff training costs (1) • Maintenance costs (1) • Possible over-reliance/risk of system failure (1) • Any other appropriate response <p style="text-align: right;">(4 x 1)</p> <p>Any combination of advantages and disadvantages up to 4 marks. A maximum of 3 marks if only advantages or disadvantages.</p>	(4)

Question Number	Indicative content	
14 QWC i, ii, iii	<p>Discussion to address the following issues:</p> <ul style="list-style-type: none"> • <i>Issue</i> - Modern processes are highly automated; <i>Development</i> - so require a lot of electricity, or other forms of energy, to operate them • <i>Issue</i> - Modern processes are developing to replace work undertaken manually at present; <i>Development</i> - leading to further automation • <i>Issue</i> - Modern processes require more equipment/machinery/tooling; <i>Development</i> - leading to higher energy consumption earlier in the supply chain • <i>Issue</i> - Modern processes are most efficient at higher volumes; <i>Development</i> - leading to higher production rates and therefore overall energy consumption increases • <i>Issue</i> - Efficient modern processes may lead to a reduction in costs, meaning lower prices; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The use of efficient modern processes may lead to economic wealth; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The complexity of modern processes may lead to specialisation and production being concentrated in a particular area of the world; <i>Development</i> - leading to increased energy use for transportation <p>Or other appropriate answer</p>	
Level	Mark	Descriptor
	0	No material deserving of reward.
1	1-2	Candidate identifies the issue(s) with no development OR identifies and develops one issue. Shows limited understanding of the issues. The student uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.
2	3-4	Candidate identifies some issues with associated developments showing some understanding of the issues. The student uses some technological/manufacturing terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.
3	5-6	Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues, including those associated with the inconsistency between efficiency and consumption. The student uses a range of appropriate technological/manufacturing terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Manufacturing (Double Award) Engineering (Double Award)

Unit 3B: Application of Technology in Engineering and Manufacturing
Paper 2: Food and Drink, Biological and Chemical

Sample Assessment Material

Time: 1 hour 30 minutes

Paper Reference

5EM03/3B

You must have:

Notes and sketches collected during your Pre-release research.
Ruler, Pen, Pencil, Rubber.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** the questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The question labelled with an **asterisk** (*) is where the quality of your written communication will be assessed.
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on this question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A

Answer ALL questions.

Question 1 must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 All of the products listed below belong to a manufacturing sector.

(a) Put a cross in the **two** boxes below where the products belong to the **food and drink** sector.

(2)

Products	Put a cross in two boxes below
Sun-tan lotion	<input type="checkbox"/>
Tomato ketchup	<input type="checkbox"/>
Calculator	<input type="checkbox"/>
Orange juice	<input type="checkbox"/>
Street maps	<input type="checkbox"/>
Football shin pads	<input type="checkbox"/>

(b) Put a cross in the **two** boxes below where the products belong to the **biological and chemical** sector.

(2)

Products	Put a cross in two boxes below
Filing cabinets	<input type="checkbox"/>
Disinfectant	<input type="checkbox"/>
Fuel injection systems	<input type="checkbox"/>
Dried yeast	<input type="checkbox"/>
High energy snack bar	<input type="checkbox"/>
Leather wallet	<input type="checkbox"/>

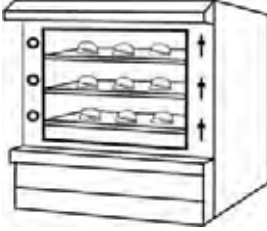
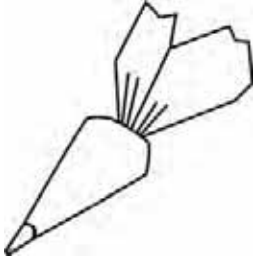
(Total for Question 1 = 4 marks)

2 The tables below show some equipment used in the manufacture of products.

(a) Complete Table 1 by naming each piece of equipment.

(2)


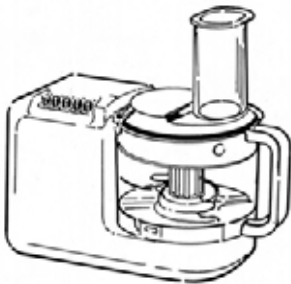
Table 1

Equipment	Equipment name	Use
		A piece of equipment used to bake bread, cakes, biscuit mixtures etc.
		Used to decorate pastries and cakes with whipped dairy cream, fill jam tarts and other similar uses.

(b) Complete Table 2 by explaining what each piece of equipment is used for.

(4)

Table 2

Equipment	Equipment name	Use
	Sieve	
	Food processor	

(Total for Question 2 = 6 marks)

3 Draw a straight line to link each **Term** listed below to the correct **Key Area**.

Each Key Area can be used more than once.

Term

Key Area

Preservative

Modern materials

Computer-integrated
manufacture (CIM)

Internet sites

Control technology

Stabiliser

Modified starch

Information
and Communications
Technology (ICT)

Process control

Spreadsheets

(Total for Question 3 = 7 marks)

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4 Packs of bread rolls belong to the food and drink sector.

(a) Name **one** other product from this sector, apart from packs of bread rolls, that utilises control technology and modern materials in its manufacture.

(1)

.....
.....

(b) (i) State **one** modern material used in the manufacture of the product you named in 4(a).

(1)

.....
.....

(ii) Explain **two** benefits to the **manufacturer** of using this material.

(4)

1
.....
.....

2
.....
.....

(c) (i) State **one** type of control technology used in manufacturing.

(1)

.....
.....

(ii) Explain **one advantage** to the **manufacturer** of using control technology. (2)

.....

.....

.....

.....

(iii) Explain **one disadvantage** to the **manufacturer** of using control technology. (2)

.....

.....

.....

.....

(Total for Question 4 = 11 marks)

5 Computer-aided design (CAD) and Computer-aided manufacture (CAM) are both used by manufacturers of food, drink, biological and chemical products.

(a) Describe **one** use of CAM when manufacturing products. (2)

.....

.....

.....

.....

(b) (i) State **two** benefits to the **consumer** of using CAM when manufacturing. (2)

1

.....

.....

2

.....

.....

(ii) Explain **two** benefits to a **manufacturer** of using CAD. (4)

1

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.....

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2

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(Total for Question 5 = 8 marks)

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6 Communications technologies are widely used by manufacturers.

(a) Explain the term **communications technology**. (2)

.....

.....

.....

(b) Mobile phones and email are examples of communications technologies.

(i) Name **one** other example of communications technology. (1)

.....

.....

(ii) Name the traditional communications method this has replaced. (1)

.....

.....

(iii) Explain **one advantage** to the **manufacturer** of using this replacement communications technology. (2)

.....

.....

.....

(iv) Explain **one disadvantage** to the **manufacturer** of using the replacement communications technology. (2)

.....

.....

.....

(Total for Question 6 = 8 marks)

7 Computer-integrated manufacturing systems (CIM) are used in the manufacture of food and drink, biological and chemical products.

(a) Describe **one** main feature of a CIM system.

(2)

.....

.....

.....

.....

(b) Explain **two** benefits to the **manufacturer** of using CIM in the production of food and drink, biological and chemical products.

(4)

1

.....

.....

2

.....

.....

(Total for Question 7 = 6 marks)

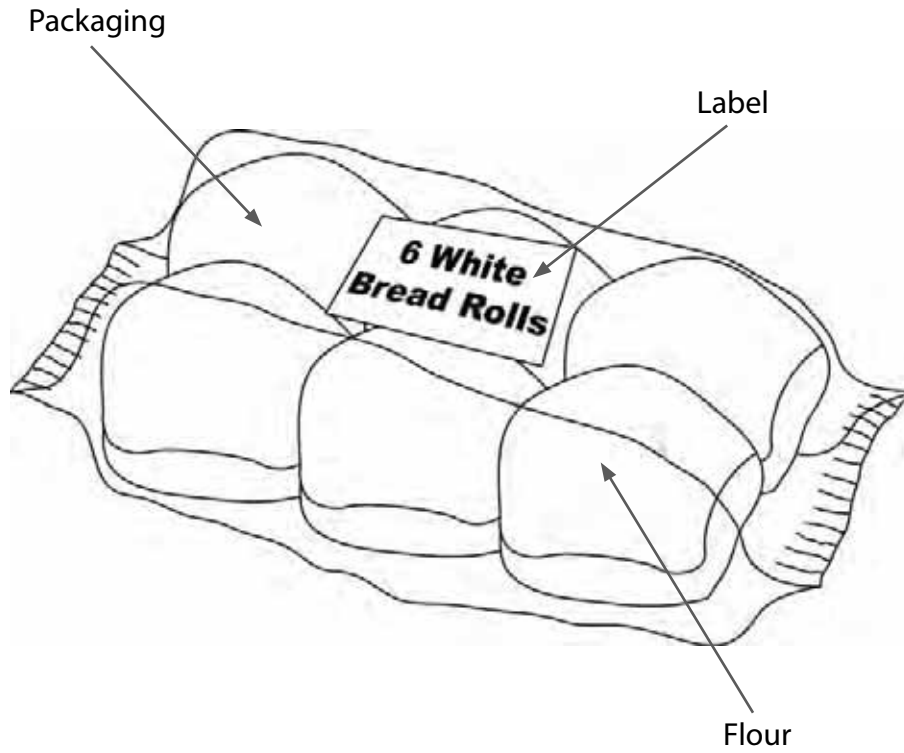
TOTAL FOR SECTION A = 50 MARKS

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TURN OVER FOR SECTION B

SECTION B

Answer ALL questions in Section B with reference to the manufacture of mass produced packs of bread rolls.

The diagram below shows a **pack of bread rolls**.



8 Describe, using notes and sketches:

(a) the function of the packaging.

(3)

Packaging

(b) the function of the flour.

(3)

Flour

(c) the function of the label.

(3)

Label

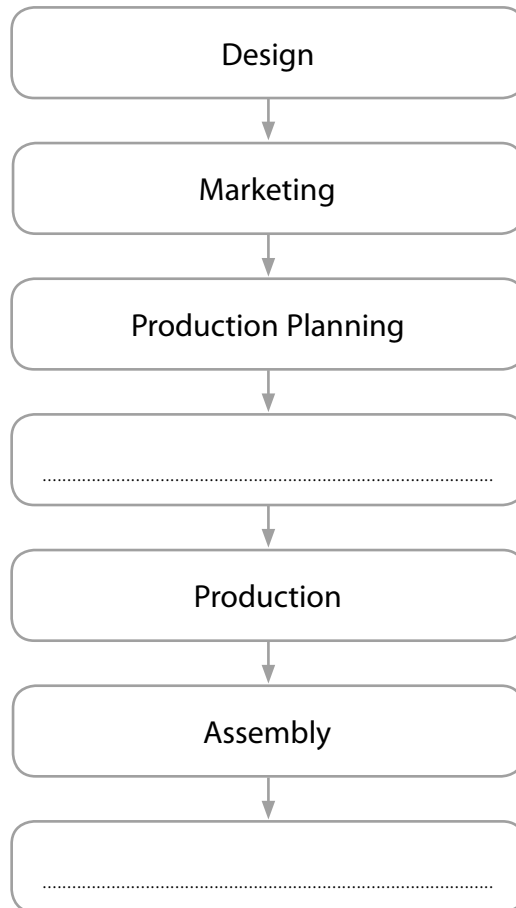
(Total for Question 8 = 9 marks)

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TURN OVER FOR QUESTION 9

9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing the packs of bread rolls.

(i) Complete the flow diagram by writing the **two** missing main stages in manufacturing packs of bread rolls.

(2)



(ii) State the stage where the bread roll dough is shaped round.

(1)

Stage

(b) Describe the following **two** stages in the manufacture of packs of bread rolls.

(i) Design

(3)

.....

.....

.....

.....

.....

.....

(ii) Production planning

(3)

.....

.....

.....

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.....

(Total for Question 9 = 9 marks)

10 Certain materials are used in the manufacture of packs of bread rolls.

(a) (i) Apart from flour and emulsifiers, state a specific material commonly used in the manufacture of the packs of bread rolls. (1)

.....
.....

(ii) Explain how the use of emulsifiers has helped to improve the characteristics of the packs of bread rolls. (2)

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

(b) Explain why high speed dough mixing (Chorleywood Bread Process) is a suitable process for the production of packs of bread rolls. (2)

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

(c) State **two** production processes other than high speed dough mixing (Chorleywood Bread Process) used in the manufacture of packs of bread rolls. (2)

1

2

(d) Explain how the use of modern materials has made domestic smoke alarms appeal to consumers.

(3)

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(Total for Question 10 = 10 marks)

11 Quality control is used in the manufacture of packs of bread rolls.

(a) Explain the term **quality control**.

(2)

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(b) (i) Describe **one** quality control procedure used at the **production** stage of the manufacture of packs of bread rolls.

(2)

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(ii) Explain **one** benefit to the **manufacturer** of applying the type of quality control procedure named in (b)(i).

(2)

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(iii) Explain **one** benefit to the **consumer** of applying the type of quality control procedure named in (b)(i).

(2)

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(c) Explain the difference between open-loop and closed-loop quality control systems.

(4)

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(Total for Question 11 = 12 marks)

12 Information and communications technology (ICT) plays an important role in the manufacture of packs of bread rolls.

(a) (i) Describe **one** use of ICT in the **design** stage of the packs of bread rolls. (2)

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(ii) State **two** benefits of the use of ICT at the **design** stage. (2)

1

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2

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(b) (i) Describe **one** use of computer control in the **packaging and dispatch** stage of manufacturing the packs of bread rolls. (2)

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(ii) Explain **two** advantages of using computer control at the **packaging and dispatch** stage.

(4)

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(Total for Question 12 = 10 marks)

13 Systems and control technology are used in modern food and drink, biological and chemical processes.

Referring to both advantages and disadvantages, evaluate the effect of the use of systems and control technology on **materials supply and control**.

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(Total for Question 13 = 4 marks)

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Sample Mark Scheme

Paper 2: Food and Drink, Biological and Chemical

Section A

Question Number	Answer	Mark
1(a)	<ul style="list-style-type: none"> • Tomato Ketchup • Orange juice <p>If 3 boxes or more ticked no marks.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
1(b)	<ul style="list-style-type: none"> • Disinfectant • Dried yeast <p>If 3 boxes or more ticked no marks.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none"> • Oven • Bakers oven <p>Do not accept microwave oven Do not accept any repetition of the statements from the 'meaning' box on the question paper.</p> <p style="text-align: right;">(1 x 1)</p>	(2)
	<ul style="list-style-type: none"> • Piping bag • Piping bag and tube • Piping bag and nozzle • Savoy bag <p>Accept any reference in the answer relating to the material, eg polythene piping bag, cloth piping bag.</p> <p style="text-align: right;">(1 x 1)</p>	

Question Number	Answer	Mark
2(b)	<p>An answer that makes reference to two of the following points :</p> <ul style="list-style-type: none"> • Removing lumps from flour, icing sugar etc • Incorporating air into flour • Blending two or more powdered ingredients Together, eg flour and baking powder • Making liquid mixtures smooth, eg sauces • Straining liquids, eg soup • Dusting cakes with icing sugar <p>eg used to remove any lumps from the flour (1) before sieving the baking powder and flour together (1)</p> <p style="text-align: right;">(2 x 1)</p> <hr/> <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • To make lumpy mixtures smooth, eg cut fruit/vegetables into puree • To chop ingredients, eg herbs, vegetables • To mix ingredients together quickly • To make soups, sauces etc • To make fruit/vegetable drinks, eg smoothies • To aerate mixtures, eg cake batters • To make pastry • To make cake mixtures • To make bread dough <p>Accept references to saves time, efficiency, consistency</p> <p>eg used to quickly mix cake mixtures (1) incorporating air to make the cake lighter when baked (1)</p> <p style="text-align: right;">(2 x 1)</p>	(4)

Question Number	Answer	Mark
3	<p>No mark awarded where 2 or more lines are drawn from a term. Lines do not have to be straight but term and key area must be clearly linked.</p> <ul style="list-style-type: none"> • Preservative = Modern materials • Computer Integrated Manufacture (CIM) = Control technology • Internet Sites = Information & Communications Technology (ICT) • Stabiliser = Modern materials • Modified starch = Modern materials • Process control = Control technology • Spreadsheets = Information & Communications Technology (ICT) <p style="text-align: right;">(7 x 1)</p>	(7)

Question Number	Answer	Mark
4(a)	<p>Appropriate product such as:</p> <ul style="list-style-type: none"> • Cakes • Biscuits • Yoghurt • Sausages • Ready meals <p>Accept brand name of a specific product. This list is not exhaustive; accept any product that utilises modern materials and process control from the food and drink sector.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(i)	<p>Any one of the following materials:</p> <ul style="list-style-type: none"> • Emulsifier • Antioxidant • Enzymes • Chemical aerators • Preservatives • Modified starches • Stabilizers • Gums • Dough conditioners • Flavour enhancers • Other appropriate modern material - a material currently used for the given application <p>Accept brand name of a specific material. If product given in 4(a) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through. No answer to 4(a) no marks for 4(b)(i).</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>One mark for identifying each benefit One mark for each explanation</p> <ul style="list-style-type: none"> • Longer shelf life (1) - reduced waste (1) • Lower weight (1) - increased size (1) • Better appearance (1) - improved texture (1) • Reduces staling time (1) - softer product (1) Improves flavour (1) - improved appearance(1) • reduces cost (1) - overall product easier to manufacture (1) • improved functional characteristics (1) - user friendly, ease of operation (1) • Any other appropriate functional, aesthetic characteristic that relates to the improvement of the product and benefits the manufacturer. <p>If answer in part 4(a) is inappropriate but the material given in 4(b)(i) is appropriate, allow follow through up to 2 marks for each of the two benefits. If no answer is given in part 4a but the answer to part 4(b)(ii) relates to the material stated in part 4(b)(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4(b)(i) no marks awarded for 4(b)(ii).</p> <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
4(c)(i)	<ul style="list-style-type: none"> • Process control • Quality control • PLCs • Embedded computers • Robotics • Computer control of manufacturing equipment and plant, eg temperature, speed etc <p>No marks for 'Automation'</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(c)(ii)	<p>One mark for identifying advantage One mark for why</p> <p>Appropriate advantage to the manufacturer, eg production planning</p> <ul style="list-style-type: none"> • speed (1) - faster than human application (1) <p>materials - supply and control</p> <ul style="list-style-type: none"> • cost control (1) - by less waste/faulty parts (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p>processing/production</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • competitiveness (1) - faster rates of production (1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>assembly/finishing</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>packaging/dispatch</p> <ul style="list-style-type: none"> • packaging consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
4(c)(iii)	<p>One mark for identifying disadvantage One mark for why</p> <p>Appropriate disadvantage to the manufacturer, eg</p> <ul style="list-style-type: none"> • High initial set-up costs (1) - time taken to program and test operations (1) • High cost of machinery and equipment (1) - initial outlay must be recouped before profit (1) • High maintenance costs (1) - time consuming and skilled due to nature of technology (1) • Machine downtime expensive (1) - lost production or slower throughput (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(a)	<p>One mark for identifying the use One mark for the description</p> <ul style="list-style-type: none"> • Use of digital thermostats (1) for controlling baking temperatures (1) • Use of sensors(1) for counting products on conveyors (1) • Use of ultrasonic cutters (1) for precise sizing of cake slices(1) • Use of digital scales to weigh ingredients (1). To minimise errors (1) • Use of computerised controls to adjust conveyor speeds (1) to control throughputs (1) • Any appropriate CAM machine, equipment or system <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(i)	<p>One mark for identifying each benefit up to a maximum of two</p> <ul style="list-style-type: none"> • Longer usable products (1) • Lower purchase price (1) • Shorter order times (1) • Better quality/accurate product (1) • Customer satisfaction (1) • Consistent product (1) • Product guarantee (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(ii)	<p>One mark for identifying each benefit One mark for how</p> <ul style="list-style-type: none"> • Conversion from 2D to 3D (1) for modelling (1) • Quicker development time (1) through simulation • Easy to make modifications/edit/change (1) no paper hard copies (1)/computer data (1) • Lower initial development costs (1) concurrent design processes (1) • Easy storage of data/information and retrieval (1) interaction with databases (1) • Accurately drawn (1) entry of accurate data or sizes (co-ordinates) (1) <p>Do not accept easier without explanation.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
6(a)	<p>The application of technology to transfer/manipulate information (1) from/around one source to another (1).</p> <p style="text-align: right;">(2x1)</p>	(2)

Question Number	Answer	Mark
6(b)(i)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Infrared/bluetooth • Messaging • Internet/wireless/Wi-fi • Video conferencing • Electronic point of sale (EPOS) • EDI • ISDN • Texting • Phone • Walkie talkie • Fax <p>Do not accept: TV, CAD, radio, computer/laptop/database or mobile phones/email (as in question)</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(ii)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Internet - Fax, Letter, memo, report sheets, telephone • Video conferencing - Travel to central location • Electronic point of sale (EPOS) - Stock taking, manual ordering, income calculations • EDI - postal documents • ISDN - analogue transmission • Texting - phone/conversation • Phone - telegrams • Fax - letters/memos/post <p>1 mark per relevant example must relate to technology given in 6(b)(i). If part 6(b)(i) not answered no mark awarded.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(iii)	<p>One mark for identifying the advantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - flexibility (1)/roaming location (1)/cost (1) • Internet - immediate (1)/access to vast amount of information (1) • Video conferencing - no travel expenses (1)/less time wasted in travelling (1) • Electronic point of sale (EPOS) - faster (1)/more accurate (1) • EDI - immediate transfer of information (1)/no hard copies needed (1)/less storage space (1) • ISDN - more data transferred in parallel (1), quicker/easier (1) • Texting - stored record of transaction (1), quicker/easier (1) • Phone - immediate two way conversation (1) quicker/easier (1) • Fax - hard copy record (1), quick transfer data (1) <p>Other advantages may be seen in the light of: speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced stock levels, reduced running costs, reduced lead times, calculation of sales, storage space reduced or any other appropriate response.</p> <p><i>Advantages must relate to the manufacturer. If only the original or replacement technology is given and the benefit is appropriate allow follow through up to 1 mark.</i></p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(iv)	<p>One mark for identifying the disadvantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - poor quality (1) if out of range (1) • Internet - can be slow (1) when very busy (1) • Video conferencing - can be unreliable (1) signal quality can be poor (1) • Electronic point of sale (EPOS) - can be unreliable (1) sometimes does not recognise codes (1) • EDI - cost (1) of installing new equipment (1) • ISDN - cost (1) installing new line/equipment (1) • Texting - limited service (1) cannot send large data files (1) • Phone - communication not always private (1) crossed lines/phone tapping (1) • Fax - information fades (1) if not copied (1) <p>Any other appropriate response. Disadvantages must relate to the manufacturer. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(a)	<p>Appropriate description of CIM up to two marks such as:</p> <ul style="list-style-type: none"> • CIM is a method of manufacturing in which the entire production process (1) is controlled by computer (1) • CIM integrates (1) the use of all different functions of computers (1) in a company • CIM uses a flexible design and manufacturing system (1) where the factory can be quickly changed to produce different products (1) • Uses Product Development Management (PDM) systems (1) to manage concurrent design and manufacture (1) • Involves the use of CAD, CAM, modelling and simulation, sensors (1) in manufacturing control, CAD/CAM, automation and robotics (1) <p>Any other appropriate response. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(b)	<p>One mark for identifying the benefit One mark for explanation</p> <ul style="list-style-type: none"> • Fast and efficient (1) cost-effective manufacturing (1) • Concurrent manufacturing (1) faster time to market (1) • Efficient management of overall process (1) such as design/development, production planning, QC, materials supply & control (1) • Good communication links (1) between product development/production teams/suppliers and retailers (1) • Easy access to technical data/organisational information (1) by design and/or production team (1) • Reduction in product time to market (1) using JIT (1) <p>Any other appropriate response.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Section B

Question Number	Answer	Mark
8(a)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To ensure the product is kept clean • To reduce the risk of bacterial contamination • To kept the product softer for longer • To make counting easier • To make handling easier • To make display at the point of sale easier • To encourage customers to buy more, eg six instead of four • To help with marketing • To help the consumer store the rolls • To allow the customer to feel/handle the rolls (softness) • To allow the customers to see the rolls • To allow for freezing the rolls • Any other appropriate response <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(b)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To provide the a protein structure • To mix with water to form gluten • To mix with the water to maximise yield • To give colour to the rolls, eg white or brown • To hold the carbon dioxide gas and helps make the rolls rise • To help make the rolls soft to eat • To combine with the other ingredients to make the dough/rolls • To help give the baked rolls a golden crust • Any other appropriate response <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(c)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To inform the customer about the ingredients • To inform the customer about price • Provides nutritional information • Provides information about best before/sell by • To locate bar code for epos • Give allergy information • Helps with marketing/selling the rolls • Identifies and names the rolls • Identifies the number of rolls in the product • Advises on storage conditions • Identifies manufacturer/retailer and contact information • Any other appropriate answer <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used.</p> <p style="text-align: right;">(3 x 1)</p>	(3)

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> • Materials supply and control/materials supply/materials control • Packaging and dispatch/packaging/dispatch <p>Must be in this order</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
9(a)(ii)	<ul style="list-style-type: none"> • Production/processing • Stage 5/stage five • 5/five <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
9(b)(i)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Development of the design brief (1) • Design specification for the packs of bread rolls(1) • Listing design criteria (1) • Performance requirements (1) • Development of design ideas (1) • Modelling using ICT (1) • Initial design ideas are produced (1) • Using CAD software (1) • Sketches are produced (1) by hand • Using CAD software (1) • Modelling ideas (1) • Prototyping before manufacture (1) • Preparation of samples <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the design brief of the packs of bread rolls (1) would be developed by creating designs (1) by hand and using CAD software (1) to model or make samples of the product prior to manufacture (1) (Up to a maximum of 3 marks).</p>	(3)

Question Number	Answer	Mark
9(b)(ii)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Scheduling production (1) • Converting order to production (1) • Materials requirements (1) • Scheduling production (1) • Converting order to production (1) • Materials and ingredient requirements (1) • Labour requirements (1) • Deadlines (1) • Throughputs (1) • Machinery/equipment requirements (1) • Quality checks (1) • Control points (1) • Health and safety (1) • Any other appropriate response <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the manufacturer decides how the product is going to be made (1), what materials and ingredients are needed (1) and what processes will be used during manufacturing (1).</p>	(3)

Question Number	Answer	Mark
10(a)(i)	<p>Specific materials used to make of packs of bread rolls</p> <ul style="list-style-type: none"> • Enzymes • Fats • Oils • Monosaccharides • Disaccharides/sugars • Syrups • Yeast • Milk/milk products • Malt flour • Seeds • Grains • Any other currently used material <p>Do not accept wholemeal, brown or rye flour.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
10(a)(ii)	<p>One mark for improvement One mark for how</p> <ul style="list-style-type: none"> • Helps make the rolls softer to eat (1) and bigger in size (1) • Increases the shelf life (1) and helps the rolls keep their shape (1) • Helps with flavour (1) and texture (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(b)	<p>Appropriate explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • Increased yields • Products have consistent quality • Reduced processing times • Easy to automate • Lower wages costs • Can use less expensive flours • Increased water adsorption • Better process control • Faster mixing times • Customer satisfaction increased • Any other appropriate response <p>Do not accept faster, easier, cheaper without explanation</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(c)	<p>Any two of the following:</p> <ul style="list-style-type: none"> • Dispensing • Weighing • Dividing the dough • Weighing the dough • Moulding the dough into a ball • First proving/resting the dough • Moulding the dough into roll shape • Traying/traying up • Racking • Final proving • Baking • Cooling <p>Accept any relevant description with a regional emphasis, eg docking, dusting, turning in oven etc</p> <p>One mark per response up to two</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(d)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • Rolls last longer • Cheaper prices • Less waste • Softer products • Larger volume products • More varieties to buy • Can be frozen • Different flavours • Improved eating qualities • Changes in texture, eg more open crumb • Improved aesthetics/appearance • Easier to use <p style="text-align: right;">(3 x 1)</p> <p>eg bread rolls are softer (1) although more varieties are available to buy (1). Supermarket shoppers can freeze the rolls (1).</p>	(3)

Question Number	Answer	Mark
11(a)	<p>Systems/processes/methods (1) used to ensure that products or services are designed and produced to meet or exceed customer requirements (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(i)	<p>One mark for identifying QC procedure One mark for how they are used</p> <ul style="list-style-type: none"> • Checking ingredients - weight (1) taste (1) smell (1) temperature (1) • Mixing checks - times(1) temperatures (1) dough consistency (1) • Dough weight checks (1) • Moulding/shaping checks (1) • Proving checks - temperature (1), humidity (1) time (1) • Baking checks - temperature (1), steam (1) time(1) • Use control charts (1) • Analyse data (1) • Reference to external standards (1) • Any other appropriate QC procedure <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(ii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Reduced customer complaints (1) - better products (1) • Control of costs (1) - cheaper product/more profit (1) • Avoids faulty products being made (1) - early detection (1) • Increased sales (1) - consistent products/lower prices (1) • User confidence (1) - consistent product/less returns (1) • Reduced waste (1) - control of manufacturing process (1) • Made to same quality standard (1) • Reliable product (1) - monitoring standards testing/parts (1) • Safe to consume (1) <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark.</p>	(2)

Question Number	Answer	Mark
11(b)(iii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Safer product to eat/use (1) - confidence in product reliability (1) • Consistent product (1) - ensures standards are met (1) • Longer useable life (1) - don't have to buy so often (1) • Product reliability (1) - confidence in the company (1) • Lower prices (1) - less scrap/waste (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark.</p>	(2)

Question Number	Answer	Mark
11(c)	<p>References to both open and closed systems required</p> <ul style="list-style-type: none"> • Open loop - does not use feedback to check the quality of the system • Open Loop - does not use feedback to determine if the input has achieved the desired goal • Open Loop - used in simple processes where low cost is important and feedback is not essential • Closed loop - uses feedback in order to make decisions about necessary changes • Closed loop - respond to changes as a result of feedback • Closed loop - used where greater accuracy and quicker response times are required <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
12(a)(i)	<p>One mark for the description One mark for how</p> <p>Description of use of ICT such as:</p> <ul style="list-style-type: none"> • Word processing of reports (1) during product development to aid evaluative process (1) • Using 3D modelling techniques to design and modify the packs of bread rolls(1) and calculate quantity of materials required for manufacture (1) • Storage of information (1) range of types of packs of bread rolls/ingredients/materials (1) and information in database and/or spreadsheets (1) • Use CAD modelling (1) of components (1) for different shapes/sizes/numbers in pack (1) • Create and modify design ideas (1) • Producing drawings (1) of products (1) and packaging of packs of bread rolls(1) • Presenting virtual products to clients (1) making samples for clients (1) • Making accurate working drawings (1) manufacturing specifications (1) • Develop 3D images (1) • Produce cutting lists (1) for a range of sizes (1) • Send CAD information to client via email/internet (1) for approval (1) <p style="text-align: right;">(2 x 1)</p> <p>Accept any appropriate software, eg Pro Desktop, 2D Design, no type of ICT named - no marks</p>	(2)

Question Number	Answer	Mark
12(a)(ii)	<p>A description that makes reference to any two of the following points:</p> <ul style="list-style-type: none"> • Product information available for the whole design team • Speed and efficiency of modelling • Speed and efficiency of modification of ideas • Ease/speed of creating virtual products on screen • Speed of decision making by client • Easy access to existing components in company database • Efficiency of costing materials and using lay plans that minimise waste • Or similar <p style="text-align: right;">(2 x 1)</p> <p>Allow follow through if description is appropriate (up to 2 marks)</p>	(2)

Question Number	Answer	Mark
12(b)(i)	<p>One mark for identifying the use One mark for how</p> <ul style="list-style-type: none"> • Use of bar coding (1) to monitor packaging/dispatch of packs of bread rolls (1) • Labelling systems (1) coding systems (1) • Automation processes (1) to assist with product packaging and sealing (1) • Robotics (1) to place products into cartons/trays(1) onto palettes (1) to transport products to dispatch areas (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(ii)	<p>One mark for identifying the advantage One mark for how</p> <ul style="list-style-type: none"> • Fast time to market (1) • Ease of tracking products (1) during delivery (1) • Ease of tracking products (1) on the premises (1) • Less manual labour required (1) • Robots can transport heavy items (1) • Reliability of tracking systems (1) • Any other appropriate response <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
13	<p>An evaluation that makes reference to a combination of four of the following advantages and disadvantages to a maximum of four marks:</p> <p>Possible advantages:</p> <ul style="list-style-type: none"> • Reduced lead times (1) • Orders materials (1) • More choice available (1) • New technologies and materials create demand from innovative customers (1) • Control of stock levels easier and more accurate (1) • Just-in-time supply can be managed (JIT) (1) • Superior quality product produced (1) • Any other appropriate response <p>Possible disadvantages:</p> <ul style="list-style-type: none"> • Old design products become obsolete quicker (1) • Staff training costs (1) • Maintenance costs (1) • Possible over-reliance/risk of system failure (1) • Any other appropriate response <p style="text-align: right;">(4 x 1)</p> <p>Any combination of advantages and disadvantages up to 4 marks. A maximum of 3 marks if only advantages or disadvantages.</p>	(4)

Question Number	Indicative content	
14 QWC i, ii, iii	<p>Discussion to address the following issues:</p> <ul style="list-style-type: none"> • <i>Issue</i> - Modern processes are highly automated; <i>Development</i> - so require a lot of electricity, or other forms of energy, to operate them • <i>Issue</i> - Modern processes are developing to replace work undertaken manually at present; <i>Development</i> - leading to further automation • <i>Issue</i> - Modern processes require more equipment/machinery/tooling; <i>Development</i> - leading to higher energy consumption earlier in the supply chain • <i>Issue</i> - Modern processes are most efficient at higher volumes; <i>Development</i> - leading to higher production rates and therefore overall energy consumption increases • <i>Issue</i> - Efficient modern processes may lead to a reduction in costs, meaning lower prices; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The use of efficient modern processes may lead to economic wealth; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The complexity of modern processes may lead to specialisation and production being concentrated in a particular area of the world; <i>Development</i> - leading to increased energy use for transportation <p>Or other appropriate answer</p>	
Level	Mark	Descriptor
	0	No material deserving of reward.
1	1-2	Candidate identifies the issue(s) with no development OR identifies and develops one issue. Shows limited understanding of the issues. The student uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.
2	3-4	Candidate identifies some issues with associated developments showing some understanding of the issues. The student uses some technological/manufacturing terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.
3	5-6	Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues, including those associated with the inconsistency between efficiency and consumption. The student uses a range of appropriate technological/manufacturing terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

**Manufacturing (Double Award)
Engineering (Double Award)**

Unit 3C: Application of Technology in Engineering and Manufacturing

Paper 3: Textiles and Clothing

Sample Assessment Material

Paper Reference

Time: 1 hour 30 minutes

5EM03/3C

You must have:

Notes and sketches collected during your Pre-release research.
Ruler, Pen, Pencil, Rubber.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The question labelled with an **asterisk** (*) is where the quality of your written communication will be assessed.
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on this question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A
Answer ALL questions.

Question 1 must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 All of the products listed below belong to a manufacturing sector.

(a) Put a cross in the **two** boxes below where the products belong to the **textiles** sector.

(2)

Products	Put a cross in two boxes below
Sun-tan lotion	<input type="checkbox"/>
Leather wallet	<input type="checkbox"/>
Calculator	<input type="checkbox"/>
Modular climbing frames	<input type="checkbox"/>
Street maps	<input type="checkbox"/>
Football shin pads	<input type="checkbox"/>

(b) Put a cross in the **two** boxes below where the products belong to the **clothing** sector.

(2)

Products	Put a cross in two boxes below
Filing cabinets	<input type="checkbox"/>
Mouthwash	<input type="checkbox"/>
Football shirt	<input type="checkbox"/>
Shopping trolley	<input type="checkbox"/>
High energy snack bar	<input type="checkbox"/>
Hiking boots	<input type="checkbox"/>

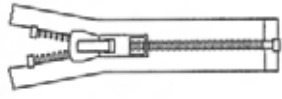
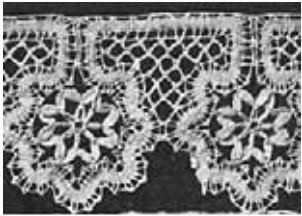
(Total for Question 1 = 4 marks)

2 The tables show some components used in the manufacture of products.

(a) Complete Table 1 by naming each component.

(2)

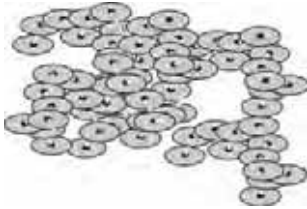

Table 1

Component	Component name	Use
		A strip of interlocking metal teeth used to temporarily fasten areas of material together.
		Can be added to edges of garments for decoration.

(b) Complete Table 2 by explaining what each component is used for.

(4)

Table 2

Component	Component name	Use
	Sequins	
	Bias Binding tape	

(Total for Question 2 = 6 marks)

3 Draw a straight line to link each **Term** listed below to the correct **Key Area**.

Each Key Area can be used more than once.

Term

Key Area

Liquid crystal coated fabrics

Modern materials

Computer-integrated manufacture (CIM)

Internet sites

Control technology

Thermo chromic dyes

Polyester fibre

Information and Communications Technology (ICT)

Process control

Spreadsheets

(Total for Question 3 = 7 marks)

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TURN OVER FOR QUESTION 4

4 Laptop cases belong to the textiles and clothing sector.

(a) Name **one** other product from this sector, apart from laptop cases, that utilises control technology and modern materials in its manufacture.

(1)

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(b) (i) State **one** modern material used in the manufacture of the product you named in 4(a).

(1)

.....

.....

(ii) Explain **two** benefits to the **manufacturer** of using this material.

(4)

1

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.....

2

.....

.....

(c) (i) State **one** type of control technology used in manufacturing.

(1)

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.....

(ii) Explain **one advantage** to the **manufacturer** of using control technology.

(2)

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(iii) Explain **one disadvantage** to the **manufacturer** of using control technology.

(2)

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(Total for Question 4 = 11 marks)

5 Computer-aided design (CAD) and Computer-aided manufacture (CAM) are both used by manufacturers of textiles and clothing products.

(a) Describe **one** use of CAM when manufacturing products.

(2)

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(b) (i) State **two** benefits to the **consumer** of using CAM when manufacturing.

(2)

1

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2

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(ii) Explain **two** benefits to a **manufacturer** of using CAD.

(4)

1

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2

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(Total for Question 5 = 8 marks)

6 Communications technologies are widely used by manufacturers.

(a) Explain the term **communications technology**.

(2)

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(b) Mobile phones and email are examples of communications technologies.

(i) Name **one** other example of communications technology.

(1)

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(ii) Name the traditional communications method this has replaced.

(1)

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(iii) Explain **one advantage** to the **manufacturer** of using this replacement communications technology.

(2)

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(iv) Explain **one disadvantage** to the **manufacturer** of using the replacement communications technology.

(2)

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(Total for Question 6 = 8 marks)

7 Computer-integrated manufacturing systems (CIM) are used in the manufacture of textiles and clothing products.

(a) Describe **one** main feature of a CIM system.

(2)

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(b) Explain **two** benefits to the **manufacturer** of using CIM in the production of textiles and clothing products.

(4)

1

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2

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(Total for Question 7 = 6 marks)

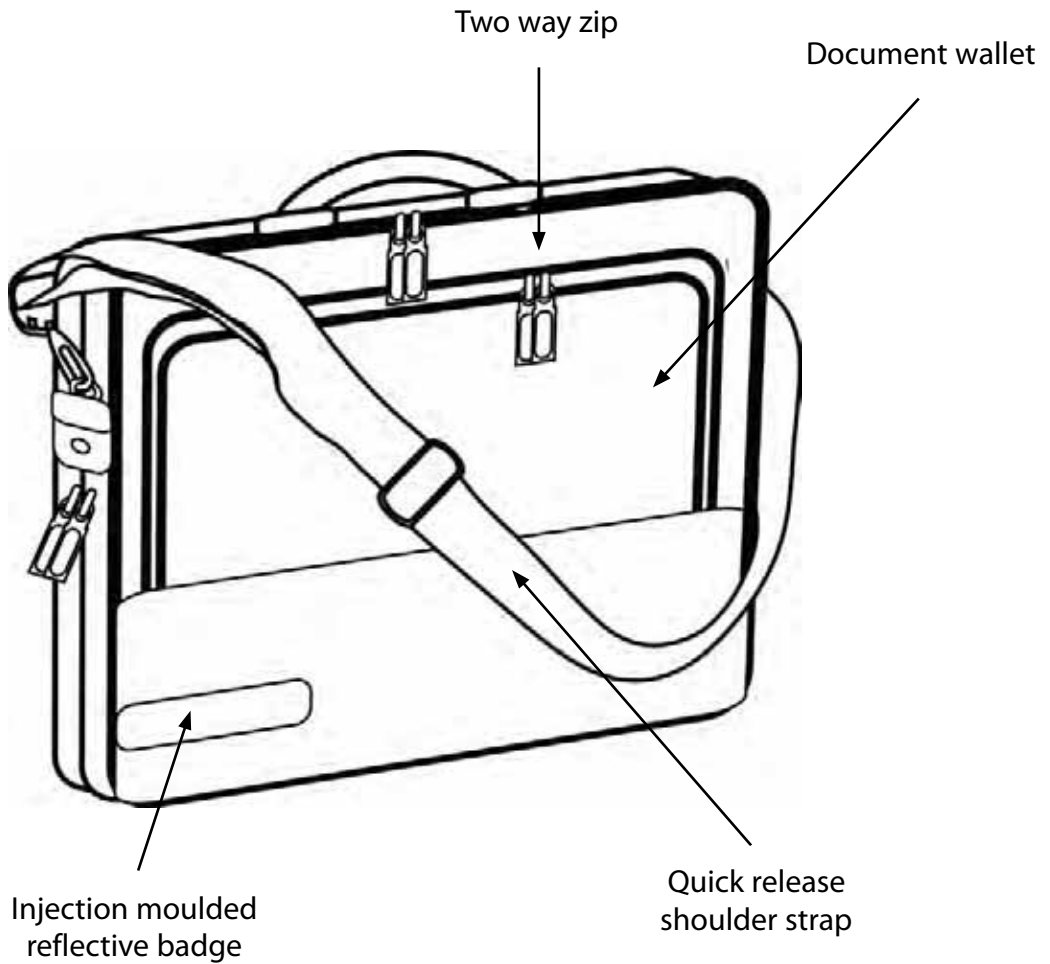
TOTAL FOR SECTION A = 50 MARKS

BLANK PAGE
TURN OVER FOR SECTION B

SECTION B

Answer ALL questions in Section B with reference to the manufacture of mass produced laptop cases.

The diagram below shows a **laptop case**.



8 Describe, using notes and sketches:

(a) the function of the injection moulded reflective rubber badge.

(3)

Injection moulded reflective rubber badge

(b) the function of the quick release shoulder strap.

(3)

Quick release shoulder strap

(c) the function of the two way zip.

(3)

Two way zip

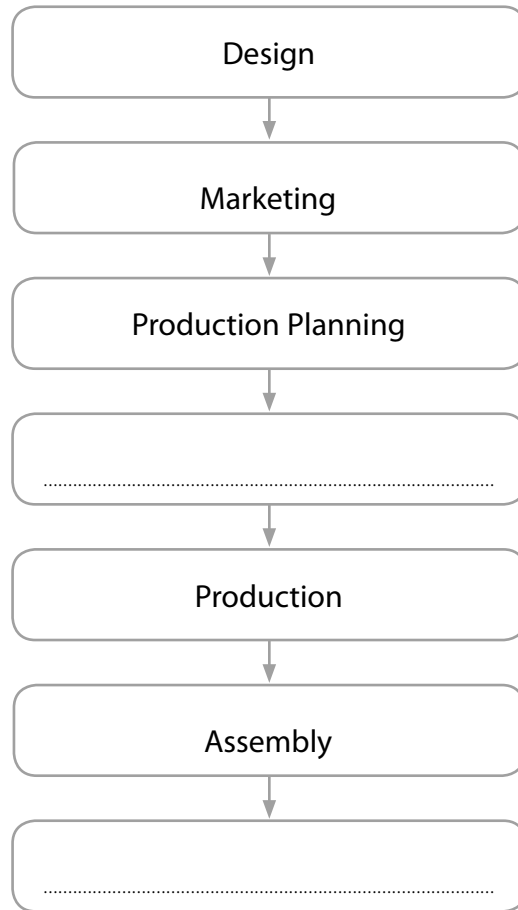
(Total for Question 8 = 9 marks)

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TURN OVER FOR QUESTION 9

9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing the laptop case.

(i) Complete the flow diagram by writing the **two** missing main stages in manufacturing laptop cases.

(2)



(ii) State the stage where the quick release shoulder strap is manufactured.

(1)

Stage

(b) Describe the following **two** stages in the manufacture of laptop cases.

(i) Design

(3)

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(ii) Production planning

(3)

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(Total for Question 9 = 9 marks)

10 Certain materials are used in the manufacture of the laptop cases.

(a) (i) Apart from high durable nylon, state a specific material commonly used in the manufacture of the laptop cases.

(1)

(ii) Explain how the use of nylon has helped to improve the function of the document wallet on the laptop cases.

(2)

(b) Explain why injection moulding is a suitable process for the production of the reflective rubber badge on the laptop case.

(2)

(c) State **two** production processes other than injection moulding used in the manufacture of laptop cases.

(2)

1

2

(d) Explain how the use of modern materials has made laptop cases appeal to office personnel.

(3)

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(Total for Question 10 = 10 marks)

11 Quality control is used in the manufacture of laptop cases.

(a) Explain the term **quality control**.

(2)

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(b) (i) Describe **one** quality control procedure used at the **production** stage of the manufacture of laptop cases.

(2)

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(ii) Explain **one** benefit to the **manufacturer** of applying the type of quality control procedure named in (b)(i).

(2)

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(iii) Explain **one** benefit to the **consumer** of applying the type of quality control procedure named in (b)(i).

(2)

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(c) Explain the difference between open-loop and closed-loop quality control systems.

(4)

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(Total for Question 11 = 12 marks)

12 Information and communications technology (ICT) plays an important role in the manufacture of laptop cases.

(a) (i) Describe **one** use of ICT in the **design** stage of the laptop case.

(2)

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(ii) State **two** benefits of the use of ICT at the **design** stage.

(2)

1

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2

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(b) (i) Describe **one** use of computer control in the **packaging and dispatch** stage of manufacturing the paper hole punch.

(2)

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(ii) Explain **two** advantages of using computer control at the **packaging and dispatch** stage.

(4)

1

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2

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(Total for Question 12 = 10 marks)

13 Systems and control technology are used in modern engineering manufacturing processes.

Referring to both advantages and disadvantages, evaluate the effect of the use of systems and control technology on **materials supply and control**.

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(Total for Question 13 = 4 marks)

Sample Mark Scheme

Paper 3: Textiles and clothing

Section A

Question Number	Answer	Mark
1(a)	<ul style="list-style-type: none">• Leather wallet• Football shin pad <p>If 3 boxes or more ticked no marks.</p> <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
1(b)	<ul style="list-style-type: none">• Football shirt• Hiking boots <p>If 3 boxes or more ticked no marks.</p> <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none">• Zip <p>Do not accept any repetition of the statements from the 'meaning' box on the question paper.</p> <p>(1 x 1)</p>	(2)
	<ul style="list-style-type: none">• Lace <p>(1 x 1)</p>	

Question Number	Answer	Mark
2(b)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • decorative component • used on evening wear, bags or other appropriate product • to make a product attractive <p>eg Used on a dress (1) to add decoration (1) (2 x 1)</p>	
	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • edging • piping • trimming • decoration to underwear • helps with stretch <p>eg a trim used on edges of underwear (1) and can help them stretch (1) (2 x 1)</p>	

Question Number	Answer	Mark
3	<p>No mark awarded where 2 or more lines are drawn from a term. Lines do not have to be straight but term and key area must be clearly linked.</p> <ul style="list-style-type: none"> • Liquid crystal coated fabrics = Modern materials • Computer Integrated Manufacture (CIM) = Control technology • Internet Sites = Information & Communications Technology (ICT) • Thermo chromic dyes = Modern materials • Polyester Fibre = Modern materials • Process control = Control technology • Spreadsheets = Information & Communications Technology (ICT) <p>(7 x 1)</p>	(7)

Question Number	Answer	Mark
4(a)	<p>Appropriate product such as:</p> <ul style="list-style-type: none"> • hiking boots • biker gloves • children’s dungarees • weather protective coats • swimsuit • backpack • football shirt • fire fighter’s suit <p>Accept brand name of a specific product. This list is not exhaustive, accept any product that contains textiles or clothing componentry or association with the sector.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(i)	<ul style="list-style-type: none"> • polyester • rubber • foam • Teflon coated fabric • nickel free zips • moulded zip pullers • Smart fabrics • Other appropriate modern material - a material currently used for the given application <p>If product given in 4(a) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through. No answer to 4(a) no marks for 4(b)(i).</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>One mark for identifying each benefit One mark for each explanation</p> <ul style="list-style-type: none"> • comfort (1) - better grip when carrying (1) • better appearance (1) - smoother/brighter finishes (1) • protection(1) -weather proof characteristics(1) • improves wear resistance (1) - harder materials/better surface finish (1) • reduces cost (1) - overall product easier/machine ability (1) • improved functional characteristics (1) - user friendly, ease of operation (1) • Any other appropriate functional/mechanical aesthetic characteristic that relates to the improvement of the product. <p>If answer in part 4(a) is inappropriate but the material given in 4(b)(i) is appropriate allow follow through up to 2 marks for each of the two benefits. If no answer is given in part 4(a) but the answer to part 4(b)(ii) relates to the material stated in part 4(b)(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4(b)(i) no marks awarded for 4(b)(ii).</p> <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
4(c)(i)	<ul style="list-style-type: none"> • Process control • Quality control • PLCs • Embedded computers • Robotics • Computer control of CNC Machinery <p>No marks for 'Automation'</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(c)(ii)	<p>One mark for identifying advantage One mark for why</p> <p>Appropriate advantage to the manufacturer, eg</p> <p>production planning</p> <ul style="list-style-type: none"> • speed (1) - faster than human application (1) <p>materials - supply and control</p> <ul style="list-style-type: none"> • cost control (1) - by less waste/faulty parts (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p>processing/production</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • competitiveness (1) - faster rates of production (1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>assembly/finishing</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>packaging/dispatch</p> <ul style="list-style-type: none"> • packaging consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
4(c)(iii)	<p>One mark for identifying disadvantage One mark for why</p> <p>Appropriate disadvantage to the manufacturer, eg</p> <ul style="list-style-type: none"> • High initial set-up costs (1) - time taken to program and test operations (1) • High cost of machinery and equipment (1) - initial outlay must be recouped before profit (1) • High maintenance costs (1) - time consuming and skilled due to nature of technology (1) • Machine downtime expensive (1) - lost production or slower throughput (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(a)	<p>One mark for identifying the use One mark for the description</p> <ul style="list-style-type: none"> • use of laser cutter (1) for cutting or engraving parts of the product (1) • use of CAM embroidery machine (1) for faster embroidery on many garments (1) • use of rapid prototyping machine(1) to model the product(1) • Any appropriate CAM machine <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(i)	<p>One mark for identifying each benefit up to a maximum of two</p> <ul style="list-style-type: none"> • more consistent products (1) • lower purchase price (1) • shorter order times (1) • better quality/accurate product (1) • customer satisfaction (1) • consistent product (1) • product guarantee (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(ii)	<p>One mark for identifying each benefit One mark for how</p> <ul style="list-style-type: none"> • Conversion from 2D to 3D (1) for modelling (1) • Quicker development time (1) through simulation • Easy to make modifications/edit/change (1) no paper hard copies (1)/computer data (1) • Lower initial development costs (1) concurrent design processes (1) • Easy storage of data/information and retrieval (1) interaction with databases (1) • Accurately drawn (1) entry of accurate data or sizes (co-ordinates) (1) <p>Do not accept easier without explanation.</p> <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
6(a)	<p>The application of technology to transfer/manipulate information (1) from/around one source to another (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(i)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Infrared/bluetooth • Messaging • Internet/wireless/Wi-fi • Video conferencing • Electronic point of sale (EPOS) • EDI • ISDN • Texting • Phone • Walkie talkie • Fax <p>Do not accept: TV, CAD, radio, computer/laptop/database or mobile phones/email (as in question)</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(ii)	<p><i>One mark for the relevant example</i></p> <ul style="list-style-type: none"> • Fax, Letter, memo, report sheets, telephone • Video conferencing - Travel to central location • Electronic point of sale (EPOS) - Stock taking, manual ordering, income calculations • EDI - postal documents • ISDN - analogue transmission • Texting - phone/conversation • Phone - telegrams • Fax - letters/memos/post <p>One mark for relevant example which must relate to technology given in 6(b)(i). If part 6(b)(i) not answered no mark awarded.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(iii)	<p>One mark for identifying the advantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - flexibility (1)/roaming location (1)/cost (1) • Internet - immediate (1)/access to vast amount of information (1) • Video conferencing - no travel expenses (1)/less time wasted in travelling (1) • Electronic point of sale (EPOS) - faster (1)/more accurate (1) • EDI - immediate transfer of information (1)/no hard copies needed (1)/less storage space (1) • ISDN - more data transferred in parallel (1), quicker/easier (1) • Texting - stored record of transaction (1), quicker/easier (1) • Phone - immediate two way conversation (1) quicker/easier (1) • Fax - hard copy record (1), quick transfer data (1) <p>Other advantages may be seen in the light of: speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced stock levels, reduced running costs, reduced lead times, calculation of sales, storage space reduced or any other appropriate response.</p> <p>Advantages must relate to the manufacturer.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(iv)	<p>One mark for identifying the disadvantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - poor quality (1) if out of range (1) • Internet - can be slow (1) when very busy (1) • Video conferencing - can be unreliable (1) signal quality can be poor (1) • Electronic point of sale (EPOS) - can be unreliable (1) sometimes does not recognise codes (1) • EDI - cost (1) of installing new equipment (1) • ISDN - cost (1) installing new line/equipment (1) • Texting - limited service (1) cannot send large data files (1) • Phone - communication not always private (1) crossed lines/phone tapping (1) • Fax - information fades (1) if not copied (1) <p>Any other appropriate response. Disadvantages must relate to the manufacturer. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(a)	<p>Appropriate description of CIM up to two marks such as:</p> <ul style="list-style-type: none"> • CIM is a method of manufacturing in which the entire production process (1) is controlled by computer (1) • CIM integrates (1) the use of all different functions of computers (1) in a company • CIM uses a flexible design and manufacturing system (1) where the factory can be quickly changed to produce different products (1) • uses Product Development Management (PDM) systems (1) to manage concurrent design and manufacture (1) • involves the use of CAD, CAM, modelling and simulation, sensors (1) in manufacturing control, CAD/CAM, automation and robotics (1) <p>Any other appropriate response. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(b)	<p>One mark for identifying the benefit One mark for explanation</p> <ul style="list-style-type: none"> • Fast and efficient (1) cost-effective manufacturing (1) • Concurrent manufacturing (1) faster time to market (1) • Efficient management of overall process (1) such as design/development, production planning, QC, materials supply & control (1) • Good communication links (1) between product development/production teams/suppliers and retailers (1) • Easy access to technical data/organisational information (1) by design and/or production team (1) • Reduction in product time to market (1) using JIT (1) <p>Any other appropriate response.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Section B

Question Number	Answer	Mark
8(a)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • reflective as a design feature • to be seen in the dark for safety when being carried by user • to highlight name of brand • aesthetics <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(b)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • can be carried by hand or on shoulder • user can pull strap longer when needed • no need for extra strap to clip on and make longer • comfort when carrying <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(c)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • for the user to gain easy access • for the user to gain quick access • to store things easily • to retrieve items more readily <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> • Materials supply and control/materials supply/materials control • Packaging and dispatch/packaging/dispatch <p>Must be in this order</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
9(a)(ii)	<ul style="list-style-type: none"> • Production/processing • Stage 5/stage five • 5/five <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
9(b)(i)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Development of the design brief (1) and design specification for the laptop case (1) • Listing design criteria (1) performance requirements (1) • Development of design ideas (1) and modelling using ICT (1) • Initial design ideas are produced (1) using CAD software (1) • Sketches are produced (1) by hand or using CAD software (1) • Modelling ideas (1) prototyping before manufacture (1) <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the design brief of the laptop case (1) would be developed by creating designs (1) by hand and using CAD software (1) to model the product prior to manufacture (1) (up to a maximum of 3 marks).</p>	(3)

Question Number	Answer	Mark
9(b)(ii)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Scheduling production (1) • Converting order to production (1) • Materials requirements (1) • Labour requirements (1) • Deadlines (1) • Throughputs (1) • Machinery/equipment requirements (1) • Quality checks (1) • Control points (1) • Health and safety (1) • Any other appropriate response <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the manufacturer decides how the product is going to be made (1), what materials are needed (1) and what processes will be used during manufacturing (1).</p>	(3)

Question Number	Answer	Mark
10(a)(i)	<p>Specific materials to make the laptop cases</p> <ul style="list-style-type: none"> • Polyester • Leather • polyamide • polythene • polypropylene • polyvinylchloride/PVC • nylon <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
10(a)(ii)	<p>One mark for improvement One mark for how</p> <ul style="list-style-type: none"> • Ease of use (1) lightweight to add in paperwork (1) • Durable (1) good wear resistance (1) • Low maintenance requirements (1) Relatively easy to wipe clean (1) <p>If no answer in 10(a)(i) then no marks. Allow follow through up to one mark if incorrect material given in 10(a)(i).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(b)	<p>Appropriate explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • Cost per unit is low • Complex shapes can be produced easily • Products have consistent quality • Rubber reflective badge can be mass produced easily <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(c)	<p>Any two of the following:</p> <ul style="list-style-type: none"> • cutting • over-locking • topstitching • lockstitch <p>Do not accept moulding</p> <p>One mark per response up to two</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(d)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • Improved wear resistance/reliability • Longer lasting parts such as the straps • Easier manufacturing • Better functionality • Easy storage of documents and accessories • More variation of products • Improved aesthetics • Smaller components/product <p style="text-align: right;">(3 x 1)</p> <p>Eg laptop cases will last a long time (1) with easy opening and closing (1) and they are easier to carry (1) when travelling to the office.</p>	(3)

Question Number	Answer	Mark
11(a)	<p>Systems/processes/methods (1) used to ensure that products or services are designed and produced to meet or exceed customer requirements (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(i)	<p>One mark for identifying QC procedure One mark for how</p> <ul style="list-style-type: none"> • check physical damage - by visual inspection (1) and checking against prototype/first-off/template etc. (1) • size checks - by direct measurement or gauging/templates/optical sensors (1) and checking against drawing/specification/tolerances (1) • dimensional checks - use of co-ordinate measuring machine (1) and analysing reported data (1) • properties testing - in system testing (1) or destructive testing of final product (1) • use of control charts (1) for statistical process control (1) • reference to BS/EN/ISO documentation (1) to comply with external standards (1) <p style="text-align: right;">(2 x 1)</p> <p>Must have relevant monitoring/control technology link.</p>	(2)

Question Number	Answer	Mark
11(b)(ii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Reduced customer complaints (1) - better products (1) • Control of costs (1) - cheaper product/more profit (1) • Avoids faulty parts being assembled (1) - early detection (1) • Increased sales (1) - consistent products/lower prices (1) • User confidence (1) - consistent product/less returns (1) • Reduced waste (1) - control of manufacturing process (1) • Made to same quality standard (1) • Reliable product (1) - monitoring standards testing/parts (1) • Ergonomically safe (1) and comfortable to use (1) • No breaking parts (1) - monitoring component/parts • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark.</p>	(2)

Question Number	Answer	Mark
11(b)(iii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Safer product to use (1) - confidence in product reliability (1) • Consistent product (1) - ensures standards are met (1) • Longer useable life (1) - don't have to buy so often (1) • Product reliability (1) - confidence in the company (1) • Lower prices (1) - less scrap/waste/more efficient (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark</p>	(2)

Question Number	Answer	Mark
11(c)	<p>References to both open and closed systems required</p> <ul style="list-style-type: none"> • Open loop - does not use feedback to check the quality of the system • Open Loop - does not use feedback to determine if the input has achieved the desired goal • Open Loop - used in simple processes where low cost is important and feedback is not essential • Closed loop - uses feedback in order to make decisions about necessary changes • Closed loop - respond to changes as a result of feedback • Closed loop - used where greater accuracy and quicker response times are required <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
12(a)(i)	<p>One mark for the description One mark for how</p> <p>Description of use of ICT such as:</p> <ul style="list-style-type: none"> • Word processing of reports (1) during product development to aid evaluative process (1) • Using 3D modelling techniques to design and modify the laptop case (1) and calculate quantity of materials required for manufacture (1) • Storage of information (1) range of types of laptop cases/components/parts (1) and information in database and/or spreadsheets (1) • Use CAD modelling (1) of components (1) for different shapes/assemblies (1) • Create and modify design ideas (1) • Producing drawings (1) of component parts (1) and assembly of laptop cases (1) • Presenting virtual products to clients (1) • Making accurate working drawings (1) manufacturing specifications (1) • Develop 3D images (1) • Produce cutting lists (1) for a range of sizes (1) • Send CAD information to client via email/internet (1) for approval (1) <p style="text-align: right;">(2 x 1)</p> <p>Accept any appropriate software, eg Pro Desktop, 2D Design, No type of ICT named - no marks</p>	(2)

Question Number	Answer	Mark
12(a)(ii)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • Product information available for the whole design team • Speed and efficiency of modelling • Speed and efficiency of modification of ideas • Ease/speed of creating virtual products on screen • Speed of decision making by client • Easy access to existing components in company database • Efficiency of costing materials and using lay plans that minimise waste • Or similar <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(i)	<p>One mark for identifying the use One mark for how</p> <ul style="list-style-type: none"> • Use of Bar coding (1) to monitor packaging/dispatch of laptop cases (1) • Labelling systems (1) to electronically tag laptop cases (1) • Automation processes (1) to assist with product packaging and sealing (1) • Robotics (1) to transport products to dispatch areas (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(ii)	<p>One mark for identifying the advantage One mark for how</p> <ul style="list-style-type: none"> • Fast time to market (1) • Ease of tracking products (1) during delivery (1) • Ease of tracking products (1) on the premises (1) • Less manual labour required (1) • Robots can transport heavy items (1) • Reliability of tracking systems (1) • Any other appropriate response <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
13	<p>An evaluation that makes reference to a combination of four of the following advantages and disadvantages to a maximum of four marks:</p> <p>Possible advantages:</p> <ul style="list-style-type: none"> • Reduced lead times (1) • Orders materials (1) • More choice available (1) • New technologies and materials create demand from innovative customers (1) • Control of stock levels easier and more accurate (1) • Just-in-time supply can be managed (JIT) (1) • Superior quality product produced (1) • Any other appropriate response <p>Possible disadvantages:</p> <ul style="list-style-type: none"> • Old design products become obsolete quicker (1) • Staff training costs (1) • Maintenance costs (1) • Possible over-reliance/risk of system failure (1) • Any other appropriate response <p style="text-align: right;">(4 x 1)</p> <p>Any combination of advantages and disadvantages up to 4 marks. A maximum of 3 marks if only advantages or disadvantages.</p>	(4)

Question Number	Indicative content	
14 QWC i, ii, iii	<p>Discussion to address the following issues:</p> <ul style="list-style-type: none"> • <i>Issue</i> - Modern processes are highly automated; <i>Development</i> - so require a lot of electricity, or other forms of energy, to operate them • <i>Issue</i> - Modern processes are developing to replace work undertaken manually at present; <i>Development</i> - leading to further automation • <i>Issue</i> - Modern processes require more equipment/machinery/tooling; <i>Development</i> - leading to higher energy consumption earlier in the supply chain • <i>Issue</i> - Modern processes are most efficient at higher volumes; <i>Development</i> - leading to higher production rates and therefore overall energy consumption increases • <i>Issue</i> - Efficient modern processes may lead to a reduction in costs, meaning lower prices; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The use of efficient modern processes may lead to economic wealth; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The complexity of modern processes may lead to specialisation and production being concentrated in a particular area of the world; <i>Development</i> - leading to increased energy use for transportation <p>Or other appropriate answer</p>	
Level	Mark	Descriptor
	0	No material deserving of reward.
1	1-2	Candidate identifies the issue(s) with no development OR identifies and develops one issue. Shows limited understanding of the issues. The student uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.
2	3-4	Candidate identifies some issues with associated developments showing some understanding of the issues. The student uses some technological/manufacturing terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.
3	5-6	Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues, including those associated with the inconsistency between efficiency and consumption. The student uses a range of appropriate technological/manufacturing terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

**Manufacturing (Double Award)
Engineering (Double Award)**

**Unit 3D: Application of Technology in Engineering and Manufacturing
Paper 4: Engineering Fabrication**

Sample Assessment Material

Time: 1 hour 30 minutes

Paper Reference

5EM03/3D

You must have:

Notes and sketches collected during your Pre-release research.
Ruler, Pen, Pencil, Rubber.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** the questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The question labelled with an **asterisk** (*) is where the quality of your written communication will be assessed.
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on this question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A

Answer ALL questions

Question 1 must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 All of the products listed below belong to an engineering sector.

(a) Put a cross in the **two** boxes below where the products belong to the **engineering fabrication** sector.

(2)

Products	Put a cross in two boxes below
Sun-tan lotion	<input type="checkbox"/>
Door handles	<input type="checkbox"/>
Calculator	<input type="checkbox"/>
Modular climbing frames	<input type="checkbox"/>
Street maps	<input type="checkbox"/>
Football shin pads	<input type="checkbox"/>

(b) Put a cross in the **two** boxes below where the products belong to the **engineering fabrication** sector.

(2)

Products	Put a cross in two boxes below
Filing cabinets	<input type="checkbox"/>
Mouthwash	<input type="checkbox"/>
Fuel injection systems	<input type="checkbox"/>
Shopping trolley	<input type="checkbox"/>
High energy snack bar	<input type="checkbox"/>
Leather wallet	<input type="checkbox"/>

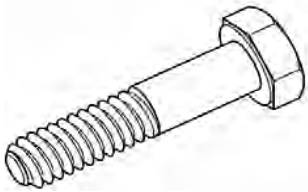
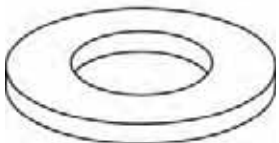
(Total for Question 1 = 4 marks)

2 The tables show some components used in the engineering of products.

(a) Complete Table 1 by naming each component.

(2)

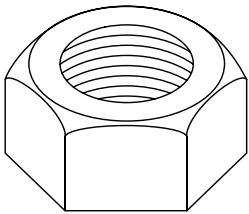

Table 1

Component	Component name	Use
		A rotating fastener used to bind two materials together.
		Used with a rotating fastener to spread the load

(b) Complete Table 2 by explaining what each component is used for.

(4)

Table 2

Component	Component name	Use
	Nut	
	Pop rivet	

(Total for Question 2 = 6 marks)

3 Draw a straight line to link each **Term** listed below to the correct **Key Area**.

Each Key Area can be used more than once.

Term

Key Area

Shape memory alloy

Modern materials

Computer-integrated
manufacture (CIM)

Internet sites

Control technology

Titanium

Carbon fibre

Information and Communications
Technology (ICT)

Process control

Spreadsheets

(Total for Question 3 = 7 marks)

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TURN OVER FOR QUESTION 4

4 Paper hole punches belong to the engineering fabrication sector.

(a) Name **one** other product from this sector, apart from a paper hole punch, that utilises control technology and modern materials in its manufacture.

(1)

.....
.....

(b) (i) State **one** modern material used in the manufacture of the product you named in 4(a).

(1)

.....
.....

(ii) Explain **two** benefits to the **manufacturer** of using this material.

(4)

1

.....
.....

2

.....
.....

(c) (i) State **one** type of control technology used in manufacturing.

(1)

.....
.....

(ii) Explain **one advantage** to the **manufacturer** of using control technology. (2)

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(iii) Explain **one disadvantage** to the **manufacturer** of using control technology. (2)

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(Total for Question 4 = 11 marks)

5 Computer-aided design (CAD) and Computer-aided manufacture (CAM) are both used by manufacturers of fabricated products.

(a) Describe **one** use of CAM when manufacturing products. (2)

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.....

(b) (i) State **two** benefits to the **consumer** of using CAM when manufacturing. (2)

1

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2

.....

(ii) Explain **two** benefits to a **manufacturer** of using CAD. (4)

1

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2

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(Total for Question 5 = 8 marks)

6 Communications technologies are widely used by manufacturers.

(a) Explain the term **communications technology**. (2)

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(b) Mobile phones and email are examples of communications technologies.

(i) Name **one** other example of communications technology. (1)

.....

.....

(ii) Name the traditional communications method this has replaced. (1)

.....

.....

(iii) Explain **one advantage** to the **manufacturer** of using this replacement communications technology. (2)

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.....

.....

(iv) Explain **one disadvantage** to the **manufacturer** of using the replacement communications technology. (2)

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(Total for Question 6 = 8 marks)

7 Computer-integrated manufacturing systems (CIM) are used in the engineering of fabricated products.

(a) Describe **one** main feature of a CIM system.

(2)

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(b) Explain **two** benefits to the **manufacturer** of using CIM in the production of fabricated products.

(4)

1

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2

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(Total for Question 7 = 6 marks)

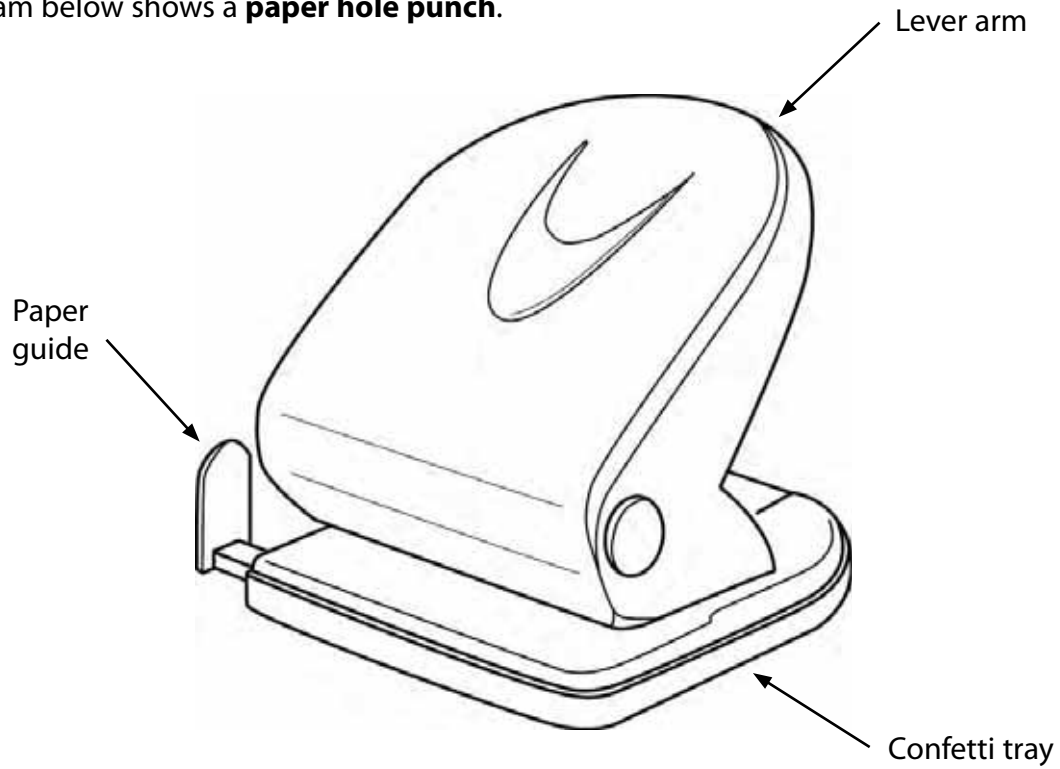
TOTAL FOR SECTION A = 50 MARKS

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TURN OVER FOR SECTION B

SECTION B

Answer ALL questions in Section B with reference to the manufacture of mass produced paper hole punches.

The diagram below shows a **paper hole punch**.



8 Describe, using notes and sketches:

(a) the function of the paper guide.

(3)

Paper guide

(b) the function of the lever arm.

(3)

Lever arm

(c) the function of the confetti tray.

(3)

Confetti tray

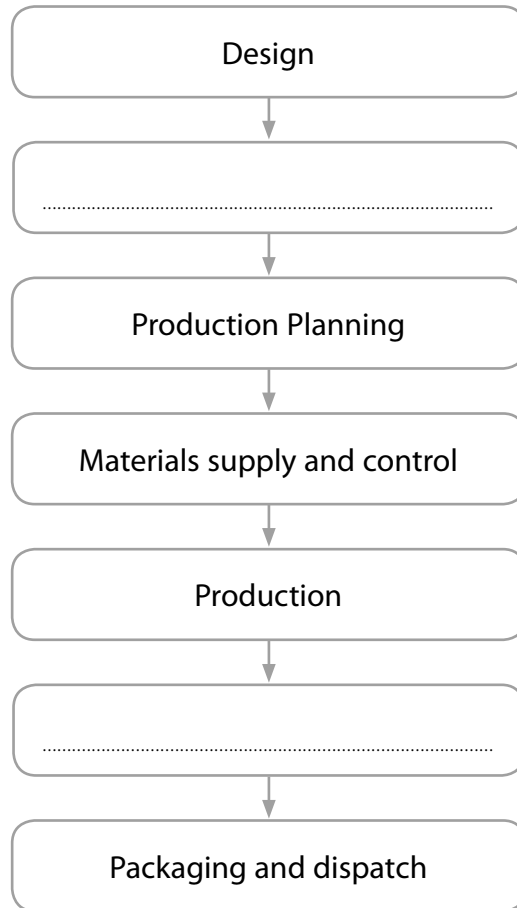
(Total for Question 8 = 9 marks)

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TURN OVER FOR QUESTION 9

9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing the paper hole punch.

(i) Complete the flow diagram by writing the **two** missing main stages in manufacturing paper hole punches.

(2)



(ii) State the stage where the lever arm is press formed.

(1)

Stage

(b) Describe the following **two** stages in the manufacture of paper hole punches.

(i) Design

(3)

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(ii) Production planning

(3)

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(Total for Question 9 = 9 marks)

10 Certain materials are used in the manufacture of the paper hole punch.

(a) (i) State a specific polymer commonly used in the manufacture of the paper hole punch. (1)

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.....

(ii) Explain how the use of steel has helped to improve the function of the blade cylinders on the paper hole punch. (2)

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.....

(b) Explain why press forming is a suitable process for the production of the lever arm of the paper hole punch. (2)

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.....
.....

(c) State **two** production processes, other than press forming, used in the manufacture of paper hole punches. (2)

1

2

(d) Explain how the use of modern materials has made paper hole punches appeal to office personnel.

(3)

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(Total for Question 10 = 10 marks)

11 Quality control is used in the manufacture of paper hole punches.

(a) Explain the term **quality control**.

(2)

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(b) (i) Describe **one** quality control procedure used at the **production** stage of the manufacture of paper hole punches.

(2)

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(ii) Explain **one** benefit to the **manufacturer** of applying the type of quality control procedure named in (b)(i).

(2)

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(iii) Explain **one** benefit to the **consumer** of applying the type of quality control procedure named in (b)(i).

(2)

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(c) Explain the difference between open-loop and closed-loop quality control systems.

(4)

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(Total for Question 11 = 12 marks)

12 Information and communications technology (ICT) plays an important role in the manufacture of paper hole punches.

(a) (i) Describe **one** use of ICT in the **design** stage of the paper hole punch. (2)

.....

.....

.....

.....

(ii) State **two** benefits of the use of ICT at the **design** stage. (2)

1

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2

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(b) (i) Describe **one** use of computer control in the **packaging and dispatch** stage of manufacturing the paper hole punch. (2)

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(ii) Explain **two** advantages of using computer control at the **packaging and dispatch** stage.

(4)

1

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2

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(Total for Question 12 = 10 marks)

13 Systems and control technology are used in modern engineering manufacturing processes.

Referring to both advantages and disadvantages, evaluate the effect of the use of systems and control technology on **materials supply and control**.

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(Total for Question 13 = 4 marks)

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Sample Mark Scheme

Paper 4: Engineering and Fabrication

Section A

Question Number	Answer	Mark
1(a)	<ul style="list-style-type: none">• Door handles• Modular climbing frame <p>If 3 boxes or more ticked no marks.</p> <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
1(b)	<ul style="list-style-type: none">• Filing cabinet• Shopping trolley <p>If 3 boxes or more ticked no marks.</p> <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none">• Bolt <p>Do not accept any repetition of the statements from the 'meaning' box on the question paper.</p> <p>(1 x 1)</p>	
	<ul style="list-style-type: none">• Washer (accept any answer that makes reference to a specific washer) eg plain washer tap washer flat washer <p>Do not accept any repetition of the statements from the 'use' box on the question paper.</p> <p>(1 x 1)</p>	

Question Number	Answer	Mark
2(b)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • mechanical fastening • securing parts/materials/components • used with a washer/bolt • temporary fastening <p>eg used with a bolt (1) to hold components together (1).</p> <p>Do not accept any repetition of the statement from the 'component name' box on the question paper.</p> <p style="text-align: right;">(2 x 1)</p>	
	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • joining two pieces of material together • used on sheet steel • a semi or permanent fixing • joined from one side only <p>eg A fastener used to join two pieces of material (1) when access is from one side only (1).</p> <p>Do not accept any repetition of the statement from the 'component name' box on the question paper.</p> <p style="text-align: right;">(2 x 1)</p>	

Question Number	Answer	Mark
3	<p>No mark awarded where 2 or more lines are drawn from a term. Lines do not have to be straight but term and key area must be clearly linked.</p> <ul style="list-style-type: none"> • Shape memory alloys = Modern materials • Computer Integrated Manufacture (CIM) = Control technology • Internet Sites = Information & Communications Technology (ICT) • Titanium = Modern materials • Carbon Fibre = Modern materials • Process control = Control technology • Spreadsheets = Information & Communications Technology (ICT) <p style="text-align: right;">(7 x 1)</p>	(7)

Question Number	Answer	Mark
4(a)	<p>Appropriate product such as:</p> <ul style="list-style-type: none"> • toolbox • bbq • darts • mountain bike • filing cabinet • car • motorbike <p>Accept brand name of a specific product.</p> <p>This list is not exhaustive; accept any product that contains mechanical or automotive componentry or association with the sector.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(i)	<ul style="list-style-type: none"> • Alloys • Copper • Zinc • Brass • Aluminium alloys • Titanium, Duralumin • Iron alloys • Steel/stainless steel/carbon steels • Composites/carbon fibre/glass reinforced plastics (GRP) • Smart materials - shape memory alloys (SMAs)/thermo-ceramics <p>If product given in 4(a) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through.</p> <p>No answer to 4(a) no marks for 4(b)(i).</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>One mark for identifying each advantage One mark for each explanation</p> <ul style="list-style-type: none"> • smaller size (1) - miniaturisation (1) • lower weight (1) - better strength to weight ratio (1) • better appearance (1) - smoother/brighter finishes (1) • extends the life-time of product (1) - better wear characteristics (1) • improves wear resistance (1) - harder materials/better surface finish (1) • reduces cost (1) - overall product easier/machine ability (1) • improved functional characteristics (1) - user friendly, ease of operation (1) • Any other appropriate functional/mechanical aesthetic characteristic that relates to the improvement of the product. <p>If answer in part 4(a) is inappropriate but the material given in 4(b)(i) is appropriate allow follow through up to 2 marks for each of the two benefits. If no answer is given in part 4(a) but the answer to part 4(b)(ii) relates to the material stated in part 4(b)(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4(b)(i) no marks awarded for 4b(ii).</p> <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
4(c)(i)	<ul style="list-style-type: none"> • Process control • Quality control • PLCs • Embedded computers • Robotics • Computer control of CNC Machinery <p>No marks for 'Automation'</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(c)(ii)	<p>One mark for identifying advantage One mark for why</p> <p>Appropriate advantage to the manufacturer, eg</p> <p>production planning</p> <ul style="list-style-type: none"> • speed (1) - faster than human application (1) <p>materials - supply and control</p> <ul style="list-style-type: none"> • cost control (1) - by less waste/faulty parts (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p>processing/production</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • competitiveness (1) - faster rates of production (1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>assembly/finishing</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>packaging/dispatch</p> <ul style="list-style-type: none"> • packaging consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
4(c)(iii)	<p>One mark for identifying disadvantage One mark for why</p> <p>Appropriate disadvantage to the manufacturer, eg</p> <ul style="list-style-type: none"> • High initial set up costs • High cost of machinery and equipment • High maintenance costs • Machine downtime expensive <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(a)	<p>One mark for identifying the use One mark for the description</p> <ul style="list-style-type: none"> • Use of CNC lathe (1) for turning the product (1) • Use of CNC miller (1) for milling the product (1) • Use of Laser Cutter (1) for cutting or engraving the product (1) • Use of CNC drill (1) to produce holes in the product (1) • Use of CNC router (1) to cut and shape the product (1) • Use of rapid prototyping machine(1) to model the product(1) • Any appropriate CAM machine <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(i)	<p>One mark for identifying each benefit up to a maximum of two</p> <ul style="list-style-type: none"> • more consistent products (1) • lower purchase price (1) • shorter order times (1) • better quality/accurate product (1) • customer satisfaction (1) • consistent product (1) • product guarantee (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(ii)	<p>One mark for identifying each benefit One mark for how</p> <ul style="list-style-type: none"> • Conversion from 2D to 3D (1) for modelling (1) • Quicker development time (1) through simulation • Easy to make modifications/edit/change (1) no paper hard copies (1)/computer data (1) • Lower initial development costs (1) concurrent design processes (1) • Easy storage of data/information and retrieval (1) interaction with databases (1) • <i>Accurately drawn (1) entry of accurate data or sizes (co-ordinates) (1)</i> <p>Do not accept 'easier' without explanation.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
6(a)	<p>The application of technology to transfer/manipulate information (1) from/around one source to another (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(i)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • infrared/bluetooth • messaging • Internet/wireless/Wi-fi • Video conferencing • Electronic point of sale (EPOS) • EDI • ISDN • Texting • Phone • Walkie talkie • Fax <p>Do not accept: TV, CAD, radio, computer/laptop/database</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(ii)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Books, journals, buyers guides, catalogues, brochures • Video conferencing - travel to central location • Electronic point of sale (EPOS) - stock taking, manual ordering, income calculations • EDI - postal documents • ISDN - analogue transmission • Texting - phone/conversation • Phone - telegrams • Fax - letters/memos/post <p>One mark for relevant example which must relate to the technology given in 6(b)(i). If part 6(b)(i) not answered no mark awarded.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(iii)	<p>One mark for identifying the advantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - flexibility (1)/roaming location (1)/cost (1) • Internet - immediate (1)/ access to vast amount of information (1) • Video conferencing - no travel expenses (1)/less time wasted in travelling (1) • Electronic point of sale (EPOS) - faster (1)/ more accurate (1) • EDI - immediate transfer of information (1)/ no hard copies needed (1)/ less storage space (1) • ISDN - more data transferred in parallel (1), quicker/easier (1) • Texting - stored record of transaction (1), quicker/easier (1) • Phone - immediate two way conversation (1) quicker/easier (1) • Fax - hard copy record (1), quick transfer data (1) <p>Other advantages may be seen in the light of: speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced stock levels, reduced running costs, reduced lead times, calculation of sales, stock taking quicker/easier, storage space reduced or any other appropriate response.</p> <p>Advantages must relate to the manufacturer.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(iv)	<p>One mark for identifying the disadvantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - poor quality (1) if out of range (1) • Internet - can be slow (1) when very busy (1) • Video conferencing - can be unreliable (1) signal quality can be poor (1) • Electronic point of sale (EPOS) - can be unreliable (1) sometimes does not recognise codes (1) • EDI - cost (1) of installing new equipment (1) • ISDN - cost (1) installing new line/equipment (1) • Texting - limited service (1) cannot send large data files (1) • Phone - communication not always private (1) crossed lines/phone tapping (1) • Fax - information fades (1) if not copied (1) <p>Any other appropriate response. Disadvantages must relate to the manufacturer. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(a)	<p>Appropriate description of CIM up to 2 marks such as:</p> <ul style="list-style-type: none"> • CIM is a method of manufacturing in which the entire production process (1) is controlled by computer (1) • CIM integrates (1) the use of all different functions of computers (1) in a company • CIM uses a flexible design and manufacturing system (1) where the factory can be quickly changed to produce different products (1) • uses Product Development Management (PDM) systems (1) to manage concurrent design and manufacture (1) • involves the use of CAD, CAM, modelling and simulation, sensors (1) in manufacturing control, CAD/CAM, automation and robotics (1) <p>Any other appropriate response. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(b)	<p>One mark for identifying the benefit One mark for explanation</p> <ul style="list-style-type: none"> • Fast and efficient (1) cost-effective manufacturing (1) • Concurrent manufacturing (1) faster time to market (1) • Efficient management of overall process (1) such as design/development, production planning, QC, materials supply & control (1) • Good communication links (1) between product development/production teams/suppliers and retailers (1) • Easy access to technical data/organisational information (1) by design and/or production team (1) • Reduction in product time to market (1) using JIT (1) <p>Any other appropriate response.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Section B

Question Number	Answer	Mark
8(a)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • An adjustable guide to ensure holes are punched in the correct place • Can be moved to allow different paper sizes to be punched • To align different paper sizes for hole punching • To alter/change the position of punched hole locations on a piece of paper <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(b)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • Used to create a force to allow the bladed cylinders to cut through paper • Use a pushing force on the pins to punch holes in paper • A pivoted arm to give leverage to punch holes in paper <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used.</p>	(3)

Question Number	Answer	Mark
8(c)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To hold all the waste pieces of paper after punching • To store waste paper and preventing a mess • To allow waste paper to deposited conveniently • To prevent damage to worktops from pushing force of punching <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used.</p>	(3)

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> • Materials supply and control/materials supply/materials control • Assembly and finishing/assembly/finishing <p>Must be in this order</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
9(a)(ii)	<ul style="list-style-type: none"> • Production/processing • Stage 5/stage five • 5/five <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
9(b)(i)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Development of the design brief (1) and design specification for the paper hole punch (1) • Listing design criteria (1) performance requirements (1) • Development of design ideas (1) and modelling using ICT (1) • Initial design ideas are produced (1) using CAD software (1) • Sketches are produced (1) by hand or using CAD software (1) • Modelling ideas (1) prototyping before manufacture (1) <p style="text-align: right;">(3 x 1)</p> <p>For eg the stage where the design brief of the paper hole punch (1) would be developed by creating designs (1) by hand and using CAD software (1) to model the product prior to manufacture (1).</p>	(3)

Question Number	Answer	Mark
9(b)(ii)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Scheduling production (1) • Converting order to production (1) • Materials requirements (1) • Labour requirements (1) • Deadlines (1) • Throughputs (1) • Machinery/equipment requirements (1) • Quality checks (1) • Control points (1) • Health and safety (1) • Any other appropriate response <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the manufacturer decides how the product is going to be made (1), what materials are needed (1) and what processes will be used during manufacturing (1).</p>	(3)

Question Number	Answer	Mark
10(a)(i)	<p>Specific polymer used for the hole punch</p> <ul style="list-style-type: none"> • Polystyrene • PVC • Polythene • Nylon • PTFE • ABS <p>Do not accept plastic/thermoplastic/thermoset</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
10(a)(ii)	<p>one mark for improvement one mark for how</p> <ul style="list-style-type: none"> • Ease of use (1) maintains sharp edge on blade (1) • Repeatability (1) good wear resistance (1) • Low maintenance requirements (1) Relatively easy to machine (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(b)	<ul style="list-style-type: none"> • Cost per unit is low • Complex shapes can be produced easily • Products have consistent quality • Lever arms can be mass produced easily <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(c)	<p>Any two of the following:</p> <ul style="list-style-type: none"> • drilling • turning • grinding • injection moulding • hardening/surface hardening • annealing/normalising • crimping • polishing/coating/painting/powder coating/plating • piercing/blanking <p>Do not accept generic answers, i.e. 'cutting' or 'moulding' one mark per response up to two</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(d)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • Improved wear resistance/reliability • Longer lasting parts such as the chuck • Moving products needed less maintenance • Easier manufacturing • Better functionality • More variation of products • Improved aesthetics • Smaller components/product <p style="text-align: right;">(3 x 1)</p>	(3)

Question Number	Answer	Mark
11(a)	<p>Systems/processes/methods (1) used to ensure that products or services are designed and produced to meet or exceed customer requirements (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(i)	<p>One mark for identifying QC procedure One mark for how</p> <ul style="list-style-type: none"> • Co-ordinate Measurement Machine (CMM) (1) • Optical sensors (1) • Inspection (1) and Testing (1) • Control charts (1) • Use control charts (1) to analyse data (1) • Data from probes (co-ordinate measurement machine CMM)(1)/optical sensors (1) is directly inputted into a computer system (1) and reports can be generated (1) • Inspection of components (1) in order to function properly (1) acceptable in accordance with its specification (1) and external standards (BS, EN ISO) (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(ii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Reduced customer complaints (1) - better products (1) • Control of costs (1) - cheaper product/ more profit (1) • Avoids faulty parts being assembled (1) - early detection (1) • Increased sales (1)- consistent products/lower prices (1) • User confidence (1) - consistent product/less returns (1) • Reduced waste (1)- control of manufacturing process (1) • Made to same quality standard (1) • Reliable product (1) - monitoring standards testing/parts (1) • Ergonomically safe (1) and comfortable to use (1) • No breaking parts (1) - monitoring component/parts • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(iii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Safer product to use (1) - confidence in product reliability (1) • Consistent product (1) - ensures standards are met (1) • Longer useable life (1) - don't have to buy so often (1) • Product reliability (1) - confidence in the company (1) • Lower prices (1) - less scrap/waste/more efficient (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(c)	<p>References to both open and closed systems required</p> <ul style="list-style-type: none"> • Open loop - does not use feedback to check the quality of the system • Open Loop - does not use feedback to determine if the input has achieved the desired goal • Open Loop - used in simple processes where low cost is important and feedback is not essential • Closed loop - uses feedback in order to make decisions about necessary changes • Closed loop - respond to changes as a result of feedback • Closed loop - used where greater accuracy and quicker response times are required <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
12(a)(i)	<p>One mark for the description One mark for how</p> <p>Description of use of ICT such as:</p> <ul style="list-style-type: none"> • Word processing of reports (1) during product development to aid evaluative process (1) • Using 3D modelling techniques to design and modify the paper hole punch (1) and calculate quantity of materials required for manufacture (1) • Storage of information (1) range of types of paper hole punches/components/parts (1) and information in database and/or spreadsheets(1) • Use CAD modelling (1) of components (1) for different shapes/assemblies (1) • Create and modify design ideas (1) • Producing drawings (1) of component parts (1) and assembly of paper hole punch (1) • Presenting virtual products to clients (1) • Making accurate working drawings (1) manufacturing specifications (1) • Develop 3D images (1) • Produce cutting lists (1) for a range of sizes (1) • Send CAD information to client via email/internet (1) for approval (1) • Or similar <p style="text-align: right;">(2 x 1)</p> <p>Accept any appropriate software, eg Pro Desktop, 2D Design No type of ICT named - no marks</p>	(2)

Question Number	Answer	Mark
12(a)(ii)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • Product information available for the whole design team • Speed and efficiency of modelling • Speed and efficiency of modification of ideas • Ease/speed of creating virtual products on screen • Speed of decision making by client • Easy access to existing components in company database • Efficiency of costing materials and using lay plans that minimise waste • Or similar <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(i)	<p>One mark for identifying the use One mark for how</p> <ul style="list-style-type: none"> • Use of Bar coding (1) to monitor packaging/dispatch of paper hole punches (1) • Labelling systems (1) to electronically tag hole punches (1) • Automation processes (1) to assist with product packaging and sealing (1) • Robotics (1) to transport products to dispatch areas (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(ii)	<p>One mark for identifying the advantage One mark for how</p> <ul style="list-style-type: none"> • Fast time to market (1) • Ease of tracking products (1) during delivery (1) • Ease of tracking products (1) on the premises (1) • Less manual labour required (1) • Robots can transport heavy items (1) • Reliability of tracking systems (1) • Any other appropriate response <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
13	<p>An evaluation that makes reference to a combination of four of the following advantages and disadvantages to a maximum of four marks:</p> <p>Possible advantages:</p> <ul style="list-style-type: none"> • Reduced lead times (1) • Orders materials (1) • More choice available (1) • New technologies and materials create demand from innovative customers (1) • Control of stock levels easier and more accurate (1) • Just-in-time supply can be managed (JIT) (1) • Superior quality product produced (1) • Any other appropriate response <p>Possible disadvantages:</p> <ul style="list-style-type: none"> • Old design products become obsolete quicker (1) • Staff training costs (1) • Maintenance costs (1) • Possible over-reliance/risk of system failure (1) • Any other appropriate response <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Indicative content	
14 QWC i, ii, iii	<p>Discussion to address the following issues:</p> <ul style="list-style-type: none"> • <i>Issue</i> - Modern processes are highly automated; <i>Development</i> - so require a lot of electricity, or other forms of energy, to operate them • <i>Issue</i> - Modern processes are developing to replace work undertaken manually at present; <i>Development</i> - leading to further automation • <i>Issue</i> - Modern processes require more equipment/machinery/tooling; <i>Development</i> - leading to higher energy consumption earlier in the supply chain • <i>Issue</i> - Modern processes are most efficient at higher volumes; <i>Development</i> - leading to higher production rates and therefore overall energy consumption increases • <i>Issue</i> - Efficient modern processes may lead to a reduction in costs, meaning lower prices; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The use of efficient modern processes may lead to economic wealth; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The complexity of modern processes may lead to specialisation and production being concentrated in a particular area of the world; <i>Development</i> - leading to increased energy use for transportation <p>Or other appropriate answer</p>	
Level	Mark	Descriptor
	0	No material deserving of reward.
1	1-2	Candidate identifies the issue(s) with no development OR identifies and develops one issue. Shows limited understanding of the issues. The student uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.
2	3-4	Candidate identifies some issues with associated developments showing some understanding of the issues. The student uses some technological/engineering terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.
3	5-6	Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues, including those associated with the inconsistency between efficiency and consumption. The student uses a range of appropriate technological/engineering terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

Manufacturing (Double Award) Engineering (Double Award)

**Unit 3E: Application of Technology in Engineering and Manufacturing
Paper 5: Electrical and Electronics, Process Control, Computers,
Telecommunications**

Sample Assessment Material

Time: 1 hour 30 Minutes

Paper Reference

5EM03/3E

You must have:

Notes and sketches collected during your Pre-release research.
Ruler, Pen, Pencil, Rubber.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The questions labelled with an **asterisk** (*) is where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on this question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A

Answer ALL questions.

Question 1 must be answered with a cross in a box . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

1 All of the products listed below belong to an engineering sector.

(a) Put a cross in the **two** boxes below where the products belong to the **electrical and electronics** sector.

(2)

Products	Put a cross in two boxes below
DVD player	<input type="checkbox"/>
Door handles	<input type="checkbox"/>
Calculator	<input type="checkbox"/>
Modular climbing frames	<input type="checkbox"/>
Street maps	<input type="checkbox"/>
Football shin pads	<input type="checkbox"/>

(b) Put a cross in the **two** boxes below where the products belong to the **computers and telecommunications** sector.

(2)

Products	Put a cross in two boxes below
Mobile phone	<input type="checkbox"/>
Mouthwash	<input type="checkbox"/>
Fuel injection systems	<input type="checkbox"/>
Shopping trolley	<input type="checkbox"/>
Printer	<input type="checkbox"/>
Leather wallet	<input type="checkbox"/>

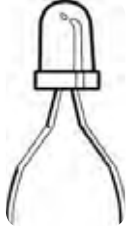

(Total for Question 1 = 4 marks)

2 The tables show some components used in the engineering of products.

(a) Complete Table 1 by naming each component.

(2)


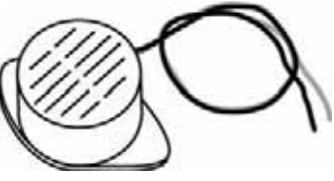
Table 1

Component	Component name	Use
		Used as small indicator lights in electronics and in applications such as flashlights
		Used in electronic circuits to limit current flow

(b) Complete Table 2 by explaining what each component is used for.

(4)

Table 2

Component	Component name	Use
	Battery	
	DC electronic buzzer	

(Total for Question 2 = 6 marks)

3 Draw a straight line to link each **Term** listed below to the correct **Key Area**.

Each Key Area can be used more than once.

Term

Key Area

Shape memory alloy

Modern materials

Computer-integrated manufacture (CIM)

Internet sites

Control technology

Titanium

Carbon fibre

Information and Communications Technology (ICT)

Process Control

Spreadsheets

(Total for Question 3 = 7 marks)

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TURN OVER FOR QUESTION 4**

4 Domestic smoke alarms belong to the electrical and electronics sector.

(a) Name **one** other product from this sector, apart from domestic smoke alarms, that utilises control technology and modern materials in its manufacture.

(1)

.....

.....

(b) (i) State **one** modern material used in the manufacture of the product you named in 4(a).

(1)

.....

.....

(ii) Explain **two** benefits to the **manufacturer** of using this material.

(4)

1

.....

.....

2

.....

.....

(c) (i) State **one** type of control technology used in manufacturing.

(1)

.....

.....

(ii) Explain **one advantage** to the **manufacturer** of using control technology. (2)

.....

.....

.....

.....

(iii) Explain **one disadvantage** to the **manufacturer** of using control technology. (2)

.....

.....

.....

.....

(Total for Question 4 = 11 marks)

5 Computer-aided design (CAD) and Computer-aided manufacture (CAM) are both used by manufacturers of electrical and electronics, process control, computers, telecommunications products.

(a) Describe **one** use of CAM when manufacturing products.

(2)

.....

.....

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.....

(b) (i) State **two** benefits to the **consumer** of using CAM when manufacturing.

(2)

1

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2

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(ii) Explain **two** benefits to a **manufacturer** of using CAD.

(4)

1

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2

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(Total for Question 5 = 8 marks)

6 Communications technologies are widely used by manufacturers.

(a) Explain the term **communications technology**. (2)

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(b) Mobile phones and email are examples of communications technologies.

(i) Name **one** other example of communications technology. (1)

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(ii) Name the traditional communications method this has replaced. (1)

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(iii) Explain **one advantage** to the **manufacturer** of using this replacement communications technology. (2)

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(iv) Explain **one disadvantage** to the **manufacturer** of using the replacement communications technology. (2)

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(Total for Question 6 = 8 marks)

7 Computer-integrated manufacturing systems (CIM) are used in the engineering of electrical and electronics, process control, computers, telecommunications products.

(a) Describe **one** main feature of a CIM system.

(2)

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(b) Explain **two** benefits to the **manufacturer** of using CIM in the production of electrical and electronics, process control, computers, telecommunications products.

(4)

1

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2

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(Total for Question 7 = 6 marks)

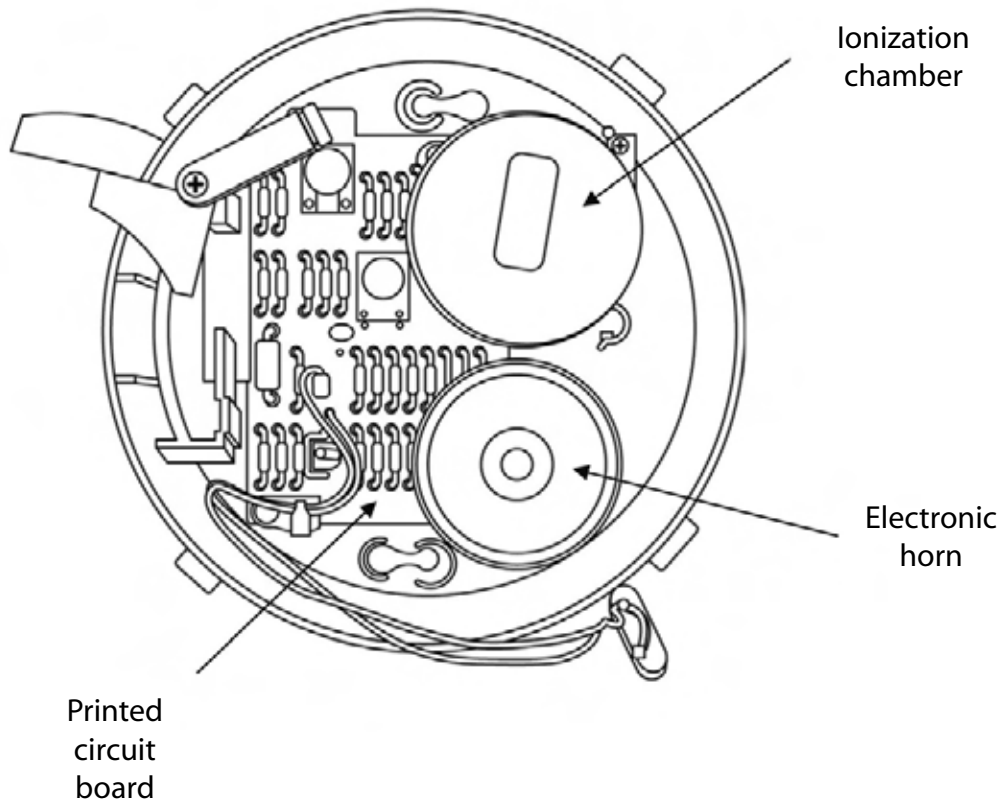
TOTAL FOR SECTION A = 50 MARKS

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TURN OVER FOR SECTION B**

SECTION B

Answer ALL questions in Section B with reference to the manufacture of mass produced domestic smoke alarm.

The diagram below shows a **domestic smoke alarm**.



8 Describe, using notes and sketches:

(a) the function or construction of the printed circuit board.

(3)

Printed circuit board

(b) the function or construction of the ionization chamber.

(3)

Ionization chamber

(c) the function or construction of the electronic horn.

(3)

Electronic horn

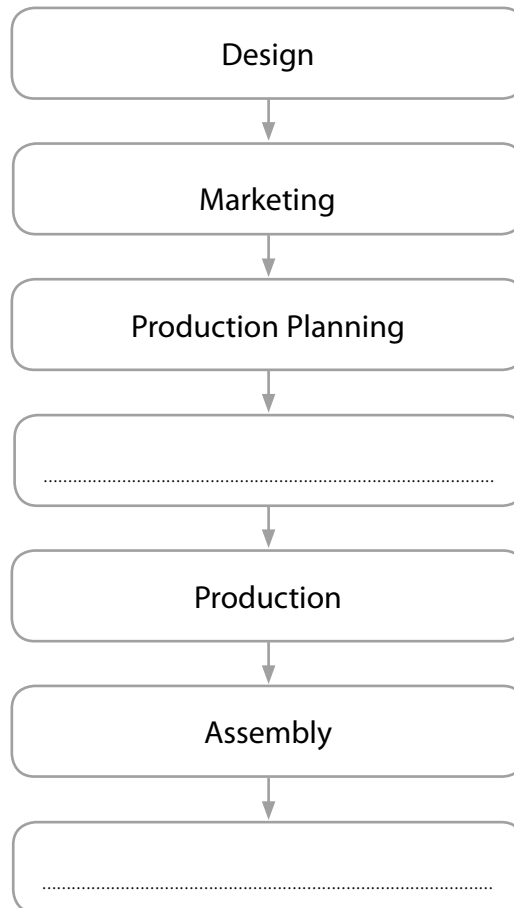
(Total for Question 8 = 9 marks)

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TURN OVER FOR QUESTION 9**

9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing the smoke alarm.

(i) Complete the flow diagram by writing the **two** missing main stages in manufacturing smoke alarms.

(2)



(ii) State the stage where the plastic cover is injection moulded.

(1)

Stage

(b) Describe the following **two** stages in the manufacture of domestic smoke alarms.

(i) Design

(3)

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(ii) Production planning

(3)

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(Total for Question 9 = 9 marks)

10 Certain materials are used in the manufacture of the domestic smoke alarm.

(a) (i) Apart from thermoplastics, state a specific material commonly used in the manufacture of the domestic smoke alarm. (1)

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(ii) Explain how the use of thermoplastics has helped to improve the function of the casing on the domestic smoke alarm. (2)

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(b) Explain why injection moulding is a suitable process for the production of the casing of the domestic smoke alarm. (2)

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(c) State **two** production processes, other than injection moulding, used in the manufacture of domestic smoke alarms. (2)

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2

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(d) Explain how the use of modern materials has made domestic smoke alarms appeal to consumers.

(3)

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(Total for Question 10 = 10 marks)

11 Quality control is used in the manufacture of domestic smoke alarms.

(a) Explain the term **quality control**.

(2)

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(b) (i) Describe **one** quality control procedure used at the **production** stage of the manufacture of domestic smoke alarms.

(2)

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(ii) Explain **one** benefit to the **manufacturer** of applying the type of quality control procedure named in (b)(i).

(2)

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(iii) Explain **one** benefit to the **consumer** of applying the type of quality control procedure named in (b)(i).

(2)

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(c) Explain the difference between open-loop and closed-loop quality control systems. (4)

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(Total for Question 11 = 12 marks)

12 Information and communications technology (ICT) plays an important role in the manufacture of domestic smoke alarms.

(a) (i) Describe **one** use of ICT in the **design** stage of the domestic smoke alarm. (2)

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(ii) State **two** benefits of the use of ICT at the **design** stage. (2)

1

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2

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(b) (i) Describe **one use** of computer control in the **packaging and dispatch** stage of manufacturing the domestic smoke alarm. (2)

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(ii) Explain **two advantages** of using computer control at the **packaging and dispatch** stage.

(4)

1

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2

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(Total for Question 12 = 10 marks)

13 Systems and control technology are used in modern engineering processes.

Referring to both advantages and disadvantages, evaluate the effect of the use of systems and control technology on **materials supply and control**.

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(Total for Question 13 = 4 marks)

***14** Electrical/electronic, process control, computer and telecommunications processes consume energy. Discuss the reasons why the use of modern production processes may lead to **increased** energy consumption.

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(Total for Question 14 = 6 marks)

TOTAL FOR SECTION B = 60 MARKS

TOTAL FOR PAPER = 110 MARKS

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Sample Mark Scheme

Paper 5: Electrical and Electronics, Process, Control, Computers, Telecommunications

Section A

Question Number	Answer	Mark
1(a)	<ul style="list-style-type: none"> • DVD Player • Calculator <p>If 3 boxes or more ticked no marks.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
1(b)	<ul style="list-style-type: none"> • Mobile phone • Printer <p>If 3 boxes or more ticked no marks.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none"> • Light Emitting Diode or LED • Do not accept lamp, light, bulb <p>Do not accept any repetition of the statements from the 'meaning' box on the question paper</p> <p style="text-align: right;">(1 x 1)</p> <hr/> <ul style="list-style-type: none"> • Resistor (accept any answer that makes reference to a specific Resistor) eg fixed resistor carbon resistor wound resistor <p>Do not accept Variable Resistor Do not accept any repetition of the statements from the 'use' box on the question paper</p> <p style="text-align: right;">(1 x 1)</p>	(2)

Question Number	Answer	Mark
2(b)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • provides electrical power • produce a direct current • converts chemical energy to electrical energy • cells that produce an electric current <p>eg produces an electric current (1) to power the electronic circuit (1)</p> <p>Do not accept any repetition of the statement from the 'component name' box on the question paper (2 x 1)</p>	
	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • used in electronic circuits to give a warning • converts electrical energy into sound energy • sounds a warning in the form of a sound • electronic signalling device <p>eg converts electrical energy into sound energy (1) in electronic circuits to provide a warning (1)</p> <p>Do not accept any repetition of the statement from the 'component name' box on the question paper (2 x 1)</p>	

Question Number	Answer	Mark
3	<p>No mark awarded where 2 or more lines are drawn from a term. Lines do not have to be straight but term and key area must be clearly linked.</p> <ul style="list-style-type: none"> • Shape memory alloys = Modern materials • Computer Integrated Manufacture (CIM) = Control technology • Internet Sites = Information & Communications Technology (ICT) • Titanium = Modern materials • Carbon Fibre = Modern materials • Process control = Control technology • Spreadsheets = Information & Communications Technology (ICT) <p style="text-align: right;">(7 x 1)</p>	(7)

Question Number	Answer	Mark
4(a)	<p>Appropriate product such as:</p> <ul style="list-style-type: none"> • mobile phone • tv • digital camera • mp3 player • computer • satellite dish • portable electric drill • soldering iron <p>Accept brand name of a specific product.</p> <p>This list is not exhaustive, accept any product that contains mechanical or automotive componentry or association with the sector.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(i)	<ul style="list-style-type: none"> • Alloys • Copper • Zinc • Brass • Aluminium alloys • Semiconductor/silicon/germanium • Radioactive material ie.americium-241 • Titanium, Duralumin • Iron alloys • steel/stainless steel/carbon steels • Composites/Carbon fibre/Glass reinforced plastics (GRP) • Smart materials - shape memory alloys (SMAs)/thermo-ceramics <p>If product given in 4(a) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through.</p> <p>No answer to 4(a) no marks for 4(b)(i).</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>One mark for identifying each advantage One mark for each explanation</p> <ul style="list-style-type: none"> • smaller size (1) - miniaturisation (1) • lower weight (1) - better strength to weight ratio (1) • better appearance (1) - smoother/brighter finishes (1) • extends the life-time of product (1) - better wear characteristics (1) • improves wear resistance (1) - harder materials/better surface finish (1) • reduces cost (1) - overall product easier/machine ability (1) • improved functional characteristics (1) - user friendly, ease of operation (1) • Any other appropriate functional/mechanical aesthetic characteristic that relates to the improvement of the product. <p>If answer in part (4a) is inappropriate but the material given in (4b)(i) is appropriate allow follow through up to 2 marks for each of the two benefits. If no answer is given in part (4a) but the answer to part (4b)(ii) relates to the material stated in part (4b)(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part (4b)(i) no marks awarded for (4b)(ii).</p> <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
4(c)(i)	<ul style="list-style-type: none"> • Process control • Quality control • PLCs • Embedded computers • Robotics • Computer control of CNC Machinery <p>No marks for 'Automation'</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(c)(ii)	<p>One mark for identifying advantage One mark for why Appropriate advantage to the manufacturer, eg</p> <p>production planning</p> <ul style="list-style-type: none"> • speed (1) - faster than human application (1) <p>materials - supply and control</p> <ul style="list-style-type: none"> • cost control (1) - by less waste/faulty parts (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p>processing/production</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • competitiveness (1) - faster rates of production (1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>assembly/finishing</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>packaging/dispatch</p> <ul style="list-style-type: none"> • packaging consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p>Low response (1) or two low responses (2) or detailed response (2)</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
4(c)(iii)	<p>One mark for identifying disadvantage One mark for why</p> <p>Appropriate disadvantage to the manufacturer, eg</p> <ul style="list-style-type: none"> • High initial set-up costs • High cost of machinery and equipment • High maintenance costs • Machine downtime expensive <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(a)	<p>One mark for identifying the use One mark for the description</p> <ul style="list-style-type: none"> • use of CNC lathe (1) for turning the product (1) • use of CNC miller (1) for milling the product (1) • use of Laser Cutter (1) for cutting or engraving the product (1) • use of CNC drill (1) to produce holes in the product (1) • use of CNC router (1) to cut and shape the product (1) • use of rapid prototyping machine(1) to model the product(1) • Any appropriate CAM machine <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(i)	<p>One mark for identifying each benefit up to a maximum of two</p> <ul style="list-style-type: none"> • more consistent products (1) • lower purchase price (1) • shorter order times (1) • better quality/accurate product (1) • customer satisfaction (1) • consistent product (1) • product guarantee (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(ii)	<p>One mark for identifying each benefit One mark for how</p> <ul style="list-style-type: none"> • Conversion from 2D to 3D (1) for modelling (1) • Quicker development time (1) through simulation • Easy to make modifications/edit/change (1) no paper hard copies (1)/computer data (1) • Lower initial development x costs (1) concurrent design processes (1) • Easy storage of data/information and retrieval (1) interaction with databases (1) • Accurately drawn (1) entry of accurate data or sizes (co-ordinates) (1) <p>Do not accept 'easier' without explanation.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
6(a)	<p>The application of technology to transfer/manipulate information (1) from/around one source to another (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(i)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • infrared/bluetooth • messaging • Internet/wireless/Wi-fi • Video conferencing • Electronic point of sale (EPOS) • EDI • ISDN • Texting • Phone • Walkie talkie • Fax <p>Do not accept: TV, CAD, radio, computer/laptop/database</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(ii)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Books, journals, buyers guides, catalogues, brochures • Video conferencing - travel to central location • Electronic point of sale (EPOS) - stock taking, manual ordering, income calculations • EDI - postal documents • ISDN - analogue transmission • Texting - phone/conversation • Phone - telegrams • Fax - letters/memos/post <p>one mark for relevant example which must relate to the technology given in 6(b)(i). If part 6(b)(i) not answered no mark awarded.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(iii)	<p>One mark for identifying the advantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - flexibility (1)/roaming location (1)/cost (1) • Internet - immediate (1)/ access to vast amount of information (1) • Video conferencing - no travel expenses (1)/less time wasted in travelling (1) • Electronic point of sale (EPOS) - faster (1)/ more accurate (1) • EDI - immediate transfer of information (1)/ no hard copies needed (1)/ less storage space (1) • ISDN - more data transferred in parallel (1), quicker/easier (1) • Texting - stored record of transaction (1), quicker/easier (1) • Phone - immediate two way conversation (1) quicker/easier (1) • Fax - hard copy record (1), quick transfer data (1) <p>Other advantages may be seen in the light of: Speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced stock levels, reduced running costs, reduced lead times, calculation of sales, stock taking quicker/easier, storage space reduced or any other appropriate response.</p> <p>Advantages must relate to the manufacturer.</p> <p style="text-align: right;">(2x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(iv)	<p>One mark for identifying the disadvantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - poor quality (1) if out of range (1) • Internet - can be slow (1) when very busy (1) • Video conferencing - can be unreliable (1) signal quality can be poor (1) • Electronic point of sale (EPOS) - can be unreliable (1) sometimes does not recognise codes (1) • EDI - cost (1) of installing new equipment (1) • ISDN - cost (1) installing new line/equipment (1) • Texting - limited service (1) cannot send large data files (1) • Phone - communication not always private (1) crossed lines/phone tapping (1) • Fax - information fades (1) if not copied (1) <p>Any other appropriate response. Disadvantages must relate to the manufacturer. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(a)	<p>Appropriate description of CIM up to 2 marks such as:</p> <ul style="list-style-type: none"> • CIM is a method of manufacturing in which the entire production process (1) is controlled by computer (1) • CIM integrates (1) the use of all different functions of computers (1) in a company • CIM uses a flexible design and manufacturing system (1) where the factory can be quickly changed to produce different products (1) • Uses Product Development Management (PDM) systems (1) to manage concurrent design and manufacture (1) • Involves the use of CAD, CAM, modelling and simulation, sensors (1) in manufacturing control, CAD/CAM, automation and robotics (1) <p>Any other appropriate response. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(b)	<p>One mark for identifying the benefit One mark for explanation</p> <ul style="list-style-type: none"> • Fast and efficient (1) cost effective manufacturing (1) • Concurrent manufacturing (1) faster time to market (1) • Efficient management of overall process (1) such as design/development, production planning, QC, materials supply & control (1) • Good communication links (1) between product development/production teams/suppliers and retailers (1) • Easy access to technical data/organisational information (1) by design and/or production team (1) • Reduction in product time to market (1) using JIT (1) <p>Any other appropriate response.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Section B

Question Number	Answer	Mark
8(a)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • used to mechanically support and electrically connect electronic components • conductive pathways, or traces, etched from copper sheets • conducting layers are made of thin copper foil • components are soldered onto copper strips <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(b)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • source of ionizing radiation to detect smoke • This type of smoke detector is more common because it is inexpensive • consists of two plates with a voltage across them, along with a radioactive source of ionizing radiation <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(c)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To sound an audible warning when smoke is detected • Converts electrical energy into sound energy • Electronic components encapsulated in plastic case • 9V supply to provide audible sound <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> • Materials supply and control/materials supply/materials control • Assembly and finishing/assembly/finishing <p>Must be in this order</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
9(a)(ii)	<ul style="list-style-type: none"> • Production/processing • Stage 5/stage five • 5/five <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
9(b)(i)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Development of the design brief (1) and design specification for the smoke alarm (1) • Listing design criteria (1) performance requirements (1) • Development of design ideas (1) and modelling using ICT (1) • Initial design ideas are produced (1) using CAD software (1) • Sketches are produced (1) by hand or using CAD software (1) • Modelling ideas (1) prototyping before manufacture (1) <p style="text-align: right;">(3 x 1)</p> <p>for eg the stage where the design brief of the smoke alarm (1) would be developed by creating designs (1) by hand and using CAD software (1) to model the product prior to manufacture (1).</p>	(3)

Question Number	Answer	Mark
9(b)(ii)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Scheduling production (1) • Converting order to production (1) • Materials requirements (1) • Labour requirements (1) • Deadlines (1) • Throughputs (1) • Machinery/equipment requirements (1) • Quality checks (1) • Control points (1) • Health and safety (1) • Any other appropriate response <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the manufacturer decides how the product is going to be made (1), what materials are needed (1) and what processes will be used during manufacturing (1).</p>	(3)

Question Number	Answer	Mark
10(a)(i)	<p>Specific materials used for the domestic smoke alarm</p> <ul style="list-style-type: none"> • copper • galvanised steel • glass laminates • polyvinylchloride/PVC • aluminium/aluminium alloy • brass • silicon • carbon <p>Do not accept polymer/plastic/metal/alloy</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
10(a)(ii)	<p>one mark for improvement one mark for how</p> <ul style="list-style-type: none"> • produce complex shapes (1) which have excellent strength attributes (1) • well-suited to the production of permanent components (1) with large, solid shapes (1) • they retain their strength and shape (1) even when heated (1) • material can be modified to suit individual customer and application (1) by changing the type of resin used(1) • can be supplied in a range of colours (1) and pleasing designs (1) <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(b)	<ul style="list-style-type: none"> • Cost per unit is low • Complex shapes can be produced easily • Products have consistent quality • Casings can be mass produced easily • Easy to automate <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(c)	<p>Any two of the following:</p> <ul style="list-style-type: none"> • drilling • vacuum forming • hardening/surface hardening • annealing/normalising • crimping • polishing/coating/painting/powder coating/plating • piercing/blanking • pick and place • soldering • compression moulding <p>Do not accept generic answers, i.e. 'cutting' or 'moulding'</p> <p>one mark per response up to two</p> <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(d)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • Improved wear resistance/reliability • Longer lasting parts • Low maintenance • Easier manufacturing • Better functionality • More variation of products • Improved aesthetics • Smaller components/product • Lighter product (low density material used) • Safer product <p style="text-align: right;">(3 x 1)</p>	(3)

Question Number	Answer	Mark
11(a)	<p>Systems/processes/methods (1) used to ensure that products or services are designed and produced to meet or exceed customer requirements (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(i)	<p>One mark for identifying QC procedure One mark for how</p> <ul style="list-style-type: none"> • Co-ordinate Measurement Machine (CMM) (1) • Optical sensors (1) • Inspection (1) and Testing (1) • Control charts (1) • Use control charts (1) to analyse data (1) • Data from probes (co-ordinate measurement machine CMM)(1)/optical sensors (1) is directly inputted into a computer system (1) and reports can be generated (1) • Inspection of components (1) in order to function properly (1) acceptable in accordance with its specification (1) and external standards (BS, EN ISO) (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(ii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Reduced customer complaints (1) - better products (1) • Control of costs (1) - cheaper product/more profit (1) • Avoids faulty parts being assembled (1) - early detection (1) • Increased sales (1)- consistent products/lower prices (1) • User confidence (1) - consistent product/less returns (1) • Reduced waste (1)- control of manufacturing process (1) • Made to same quality standard (1) • Reliable product (1) - monitoring standards testing/parts (1) • Ergonomically safe (1) and comfortable to use (1) • No breaking parts (1) - monitoring component/parts • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark</p>	(2)

Question Number	Answer	Mark
11(b)(iii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Safer product to use (1) - confidence in product reliability (1) • Consistent product (1) - ensures standards are met (1) • Longer useable life (1) - don't have to buy so often (1) • Product reliability (1) - confidence in the company (1) • Lower prices (1) - less scrap/waste/more efficient (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark</p>	(2)

Question Number	Answer	Mark
11(c)	<p>References to both open and closed systems required</p> <ul style="list-style-type: none"> • Open loop - does not use feedback to check the quality of the system • Open Loop - does not use feedback to determine if the input has achieved the desired goal • Open Loop - used in simple processes where low cost is important and feedback is not essential • Closed loop - uses feedback in order to make decisions about necessary changes • Closed loop - respond to changes as a result of feedback • Closed loop - used where greater accuracy and quicker response times are required <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
12(a)(i)	<p>One mark for the description One mark for how</p> <p>Description of use of ICT such as:</p> <ul style="list-style-type: none"> • Word processing of reports (1) during product development to aid evaluative process (1) • Using 3D modelling techniques to design and modify the smoke alarm (1) and calculate quantity of materials required for manufacture (1) • Storage of information (1) range of types of smoke alarms/components/parts (1) and information in database and/or spreadsheets(1) • Use CAD modelling (1) of components (1) for different shapes/assemblies (1) • Create and modify design ideas (1) • Producing drawings (1) of component parts (1) and assembly of smoke alarm (1) • Presenting virtual products to clients (1) • Making accurate working drawings (1) manufacturing specifications (1) • Develop 3D images (1) • Produce cutting lists (1) for a range of sizes (1) • Send CAD information to client via email/internet (1) for approval (1) • Or similar <p style="text-align: right;">(2 x 1)</p> <p>Accept any appropriate software, eg Pro Desktop, 2D Design No type of ICT named - no marks</p>	(2)

Question Number	Answer	Mark
12(a)(ii)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • Product information available for the whole design team • Speed and efficiency of modelling • Speed and efficiency of modification of ideas • Ease/speed of creating virtual products on screen • Speed of decision making by client • Easy access to existing components in company database • Efficiency of costing materials and using lay plans that minimise waste • Or similar <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(i)	<p>One mark for identifying the use One mark for how</p> <ul style="list-style-type: none"> • Use of Bar coding (1) to monitor packaging/dispatch of smoke alarm (1) • Labelling systems (1) to electronically tag smoke alarms (1) • Automation processes (1) to assist with product packaging and sealing (1) • Robotics (1) to transport products to dispatch areas (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(ii)	<p>One mark for identifying the advantage One mark for how</p> <ul style="list-style-type: none"> • Fast time to market (1) • Ease of tracking products (1) during delivery (1) • Ease of tracking products (1) on the premises (1) • Less manual labour required (1) • Robots can transport heavy items (1) • Reliability of tracking systems (1) • Any other appropriate response <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
13	<p>An evaluation that makes reference to a combination of four of the following advantages and disadvantages to a maximum of four marks:</p> <p>Possible advantages:</p> <ul style="list-style-type: none"> • Reduced lead times (1) • Orders materials (1) • More choice available (1) • New technologies and materials create demand from innovative customers (1) • Control of stock levels easier and more accurate (1) • Just-in-time supply can be managed (JIT) (1) • Superior quality product produced (1) • Any other appropriate response <p>Possible disadvantages:</p> <ul style="list-style-type: none"> • Old design products become obsolete quicker (1) • Staff training costs (1) • Maintenance costs (1) • Possible over-reliance/risk of system failure (1) • Any other appropriate response <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Indicative content	
14 QWC i, ii, iii	<p>Discussion to address the following issues:</p> <ul style="list-style-type: none"> • <i>Issue</i> - Modern processes are highly automated; <i>Development</i> - so require a lot of electricity, or other forms of energy, to operate them • <i>Issue</i> - Modern processes are developing to replace work undertaken manually at present; <i>Development</i> - leading to further automation • <i>Issue</i> - Modern processes require more equipment/machinery/tooling; <i>Development</i> - leading to higher energy consumption earlier in the supply chain • <i>Issue</i> - Modern processes are most efficient at higher volumes; <i>Development</i> - leading to higher production rates and therefore overall energy consumption increases • <i>Issue</i> - Efficient modern processes may lead to a reduction in costs, meaning lower prices; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The use of efficient modern processes may lead to economic wealth; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The complexity of modern processes may lead to specialisation and production being concentrated in a particular area of the world; <i>Development</i> - leading to increased energy use for transportation <p>Or other appropriate answer</p>	
Level	Mark	Descriptor
	0	No material deserving of reward.
1	1-2	Candidate identifies the issue(s) with no development OR identifies and develops one issue. Shows limited understanding of the issues. The student uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.
2	3-4	Candidate identifies some issues with associated developments showing some understanding of the issues. The student uses some technological/engineering terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.
3	5-6	Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues, including those associated with the inconsistency between efficiency and consumption. The student uses a range of appropriate technological/engineering terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.

Write your name here

Surname

Other names

Centre Number

Candidate Number

Edexcel GCSE

**Manufacturing (Double Award)
Engineering (Double Award)**

**Unit 3F: Application of Technology in Engineering and Manufacturing
Paper 6: Mechanical, Automotive**

Sample Assessment Material

Time: 1 hour 30 minutes

Paper Reference

5EM03/3F

You must have:

Notes and sketches collected during your Pre-release research.
Ruler, Pen, Pencil, Rubber.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The question labelled with an **asterisk** (*) is where the quality of your written communication will be assessed
– *you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on this question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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SECTION A

Answer ALL questions

Question 1 must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 All of the products listed below belong to an engineering sector.

(a) Put a cross in the **two** boxes below where the products belong to the **mechanical** sector.

(2)

Products	Put a cross in two boxes below
Sun-tan lotion	<input type="checkbox"/>
Hand brake lever	<input type="checkbox"/>
Calculator	<input type="checkbox"/>
Trolley jack	<input type="checkbox"/>
Street maps	<input type="checkbox"/>
Football shin pads	<input type="checkbox"/>

(b) Put a cross in the **two** boxes below where the products belong to the **automotive** sector.

(2)

Products	Put a cross in two boxes below
Windscreen wipers	<input type="checkbox"/>
Mouthwash	<input type="checkbox"/>
Fuel injection systems	<input type="checkbox"/>
Shopping trolley	<input type="checkbox"/>
High energy snack bar	<input type="checkbox"/>
Leather wallet	<input type="checkbox"/>

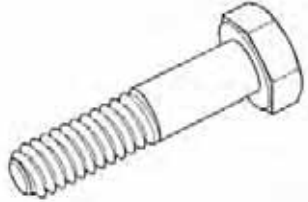
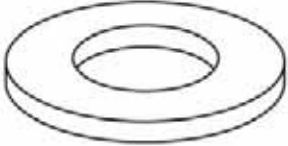
(Total for Question 1 = 4 marks)

2 The tables show some components used in the engineering of products.

(a) Complete Table 1 by naming each component.

(2)



Table 1

Component	Component name	Use
		A rotating fastener used to bind two materials together.
		Used with a rotating fastener to spread the load.

(b) Complete Table 2 by explaining what each component is used for.

(4)

Table 2

Component	Component name	Use
	Nut	
	Pop rivet	

(Total for Question 2 = 6 marks)

3 Draw a straight line to link each **Term** listed below to the correct **Key Area**.

Each Key Area can be used more than once.

Term

Key Area

Shape memory alloy

Modern materials

Computer-integrated
manufacture (CIM)

Internet sites

Control technology

Titanium

Carbon fibre

Information
and Communications
Technology (ICT)

Process control

Spreadsheets

(Total for Question 3 = 7 marks)

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TURN OVER FOR QUESTION 4

4 Cycle carriers belong to the mechanical automotive sector.

(a) Name **one** other product from this sector, apart from a cycle carrier, that utilises control technology and modern materials in its manufacture.

(1)

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(b) (i) State **one** modern material used in the manufacture of the product you named in 4(a).

(1)

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(ii) Explain **two** benefits to the **manufacturer** of using this material.

(4)

1

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.....

2

.....

.....

(c) (i) State **one** type of control technology used in manufacturing.

(1)

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(ii) Explain **one advantage** to the **manufacturer** of using control technology. (2)

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(iii) Explain **one disadvantage** to the **manufacturer** of using control technology. (2)

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(Total for Question 4 = 11 marks)

5 Computer-aided design (CAD) and Computer-aided manufacture (CAM) are both used by manufacturers of mechanical automotive products.

(a) Describe **one** use of CAM when manufacturing products.

(2)

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(b) (i) State **two** benefits to the **consumer** of using CAM when manufacturing.

(2)

1.....

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2.....

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(ii) Explain **two** benefits to a **manufacturer** of using CAD.

(4)

1.....

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2.....

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(Total for Question 5 = 8 marks)

6 Communications technologies is widely used by manufacturers.

(a) Explain the term **communications technology**.

(2)

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(b) Mobile phones and email are examples of communications technologies.

(i) Name **one** other example of communications technology.

(1)

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(ii) Name the traditional communications method this has replaced.

(1)

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(iii) Explain **one advantage** to the **manufacturer** of using this replacement communications technology.

(2)

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(iv) Explain **one disadvantage** to the **manufacturer** of using the replacement communications technology.

(2)

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(Total for Question 6 = 8 marks)

7 Computer-integrated manufacturing systems (CIM) are used in the engineering of engineered products.

(a) Describe **one** main feature of a CIM system.

(2)

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(b) Explain **two** benefits to the **manufacturer** of using CIM in the production of engineered products.

(4)

1

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2

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(Total for Question 7 = 6 marks)

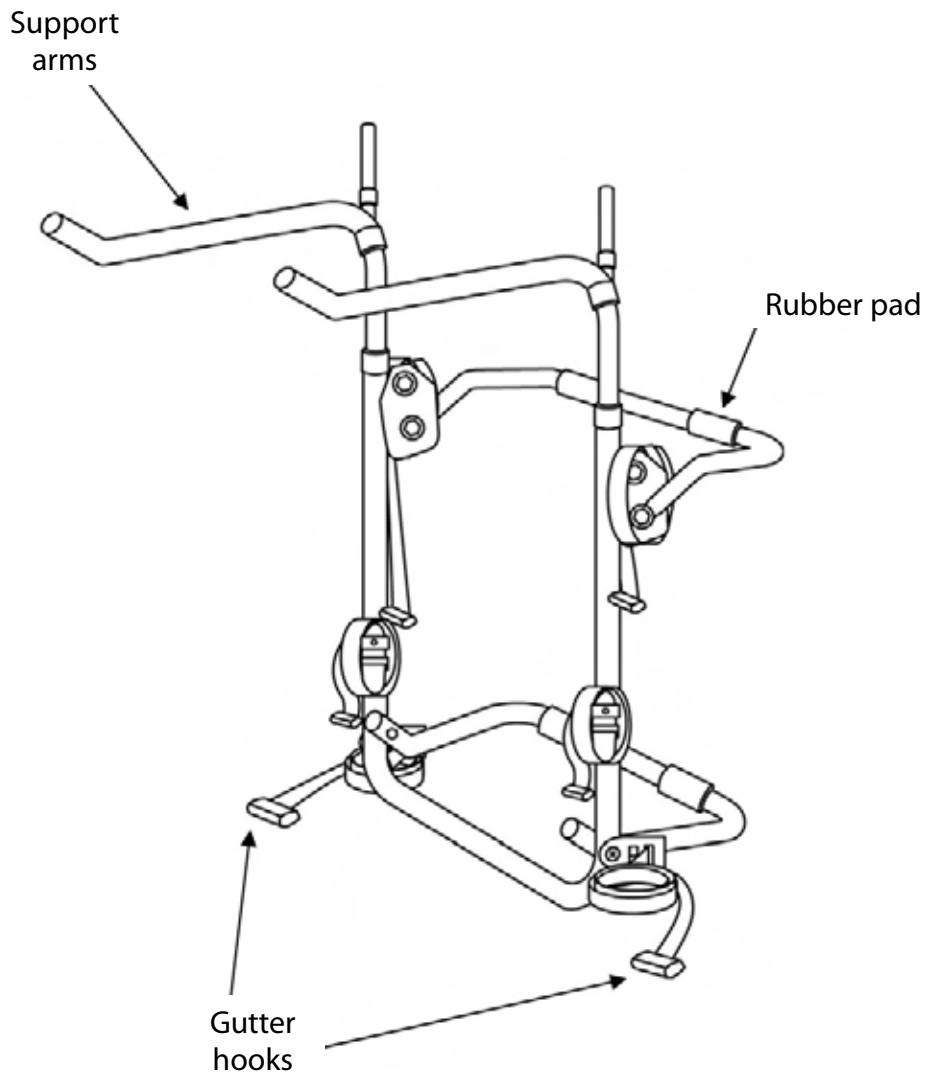
TOTAL FOR SECTION A = 50 MARKS

BLANK PAGE
TURN OVER FOR SECTION B

SECTION B

Answer ALL questions in Section B with reference to the manufacture of mass produced cycle carriers.

The diagram below shows a **cycle carrier**.



8 Describe, using notes and sketches:

(a) the function of the support arms.

(3)

Support arms



(b) the function of the gutter hooks

(3)

Gutter hooks



(c) the function of the rubber pads.

(3)

Rubber pads

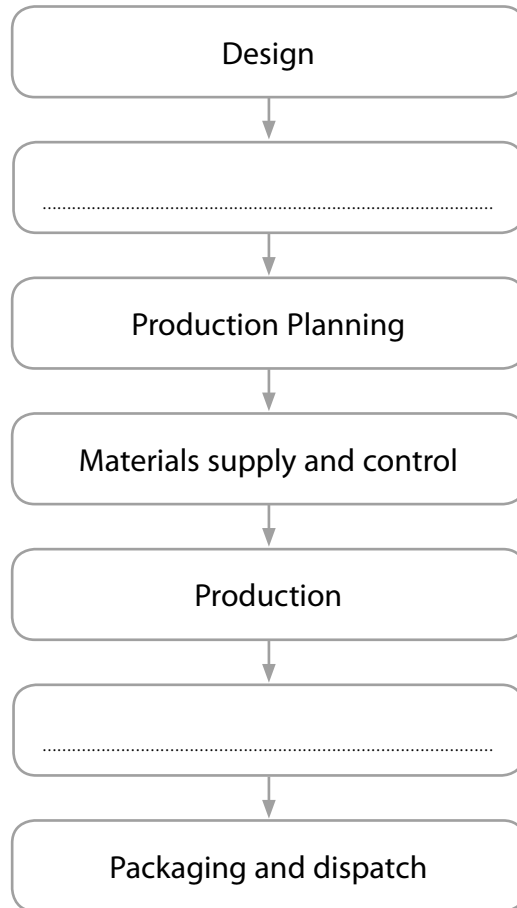
(Total for Question 8 = 9 marks)

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TURN OVER FOR QUESTION 9

9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing the cycle carrier.

(i) Complete the flow diagram by writing the **two** missing main stages in manufacturing cycle carriers.

(2)



(ii) State the stage where the gutter hooks are formed to the correct shape.

(1)

Stage

(b) Describe the following **two** stages in the manufacture of cycle carriers.

(i) Design

(3)

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(ii) Production planning

(3)

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(Total for Question 9 = 9 marks)

10 Certain materials are used in the manufacture of the cycle carrier.

(a) (i) Apart from polymers or rubbers, state a specific material commonly used in the manufacture of the cycle carrier.

(1)

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(ii) Explain how a polymer coating has improved the function of the gutter hooks on the cycle carrier.

(2)

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(b) Explain why extrusion is a suitable process for the production of the rubber pads on the cycle carrier.

(2)

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(c) State **two** production processes, other than extrusion, used in the manufacture of cycle carriers.

(2)

1.....

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2.....

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(d) Explain how the use of modern materials has made cycle carriers appeal to touring cyclists.

(3)

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(Total for Question 10 = 10 marks)

11 Quality control is used in the manufacture of cycle carriers.

(a) Explain the term **quality control**.

(2)

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(b) (i) Describe **one** quality control procedure used at the **production** stage of the manufacture of cycle carriers.

(2)

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(ii) Explain **one** benefit to the **manufacturer** of applying the type of quality control procedure named in (b)(i).

(2)

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(iii) Explain **one** benefit to the **consumer** of applying the type of quality control procedure named in (b)(i).

(2)

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(c) Explain the difference between open-loop and closed-loop quality control systems.

(4)

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(Total for Question 11 = 12 marks)

12 Information and communications technology (ICT) plays an important role in the manufacture of cycle carriers.

(a) (i) Describe **one** use of ICT in the **design** stage of the cycle carrier. (2)

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(ii) State **two** benefits of the use of ICT at the **design** stage. (2)

1

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2

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(b) (i) Describe **one** use of computer control in the **packaging and dispatch** stage of manufacturing the cycle carrier. (2)

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(ii) Explain **two** advantages of using computer control at the **packaging and dispatch** stage. (4)

1

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2

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(Total for Question 12 = 10 marks)

13 Systems and control technology are used in modern engineering manufacturing processes.

Referring to both advantages and disadvantages, evaluate the effect of the use of systems and control technology on **materials supply and control**.

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(Total for Question 13 = 4 marks)

Sample Mark Scheme

Paper 6: Mechanical Automotive

Section A

Question Number	Answer	Mark
1(a)	<ul style="list-style-type: none">• Handbrake Lever• Trolley Jack <p>If 3 boxes or more ticked no marks.</p> <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
1(b)	<ul style="list-style-type: none">• Windscreen Wipers• Fuel Injection Systems <p>If 3 boxes or more ticked no marks.</p> <p>(2 x 1)</p>	(2)

Question Number	Answer	Mark
2(a)	<ul style="list-style-type: none">• Bolt <p>Do not accept any repetition of the statements from the 'use' box on the question paper.</p> <p>(1 x 1)</p>	
	<ul style="list-style-type: none">• Washer (accept any answer that makes reference to a specific washer) eg plain washer tap washer flat washer <p>Do not accept any repetition of the statements from the 'use' box on the question paper.</p> <p>(1 x 1)</p>	

Question Number	Answer	Mark
2(b)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • mechanical fastening • securing parts/materials/components • used with a washer/bolt • temporary fastening <p>eg used with a bolt (1) to hold components together (1)</p> <p>Do not accept any repetition of the statement from the 'component name' box on the question paper (2 x 1)</p>	
	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • joining two pieces of material together • used on sheet steel • a semi or permanent fixing • joined from one side only <p>eg a fastener used to join two pieces of material (1) when access is from one side only (1)</p> <p>Do not accept any repetition of the statement from the 'component name' box on the question paper (2 x 1)</p>	

Question Number	Answer	Mark
3	<p>No mark awarded where 2 or more lines are drawn from a term. Lines do not have to be straight but term and key area must be clearly linked.</p> <ul style="list-style-type: none"> • Shape memory alloys = Modern materials • Computer Integrated Manufacture (CIM) = Control technology • Internet Sites = Information and Communications Technology (ICT) • Titanium = Modern materials • Carbon Fibre = Modern materials • Process control = Control technology • Spreadsheets = Information and Communications Technology (ICT) <p style="text-align: right;">(7 x 1)</p>	(7)

Question Number	Answer	Mark
4(a)	<p>Appropriate product such as:</p> <ul style="list-style-type: none"> • motorbike • fire extinguisher • trolley jack • foot pump • bbq • filing cabinet • car • gearbox • toolbox • hydraulic cylinder <p>Accept brand name of a specific product.</p> <p>This list is not exhaustive, accept any product that contains mechanical or automotive componentry or association with the sector.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(i)	<ul style="list-style-type: none"> • Alloys • Copper • Zinc • Brass • Aluminium alloys • Titanium, Duralumin • Iron alloys • Steel/stainless steel/carbon steels • Composites/Carbon fibre/Glass reinforced plastics (GRP) • Smart materials - shape memory alloys (SMAs)/thermo-ceramics • Polymer/plastic (although plastic is not technically correct accept the term plastic) <p>If product given in 4(a) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through. No answer to 4(a) no marks for 4(b)(i).</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>One mark for identifying each advantage One mark for each explanation</p> <ul style="list-style-type: none"> • smaller size (1) - miniaturisation (1) • lower weight (1) - better strength to weight ratio (1) • better appearance (1) - smoother/brighter finishes (1) • extends the life-time of product (1) - better wear characteristics (1) • improves wear resistance (1) - harder materials/better surface finish (1) • reduces cost (1) - overall product easier/machine ability (1) • improved functional characteristics (1) - user friendly, ease of operation (1) • Any other appropriate functional/mechanical aesthetic characteristic that relates to the improvement of the product. <p>If answer in part 4(a) is inappropriate but the material given in 4(b)(i) is appropriate allow follow through up to 2 marks for each of the two benefits. If no answer is given in part 4(a) but the answer to part 4(b)(ii) relates to the material stated in part 4(b)(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4(b)(i) no marks awarded for 4(b)(ii).</p> <p style="text-align: right;">(2 x 1) (2 x 1)</p>	(4)

Question Number	Answer	Mark
4(c)(i)	<ul style="list-style-type: none"> • Process control • Quality control • PLCs • Embedded computers • Robotics • Sensors • Computer control of CNC Machinery <p>No marks for 'Automation'</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
4(c)(ii)	<p>One mark for identifying advantage One mark for why</p> <p>Appropriate advantage to the manufacturer, eg production planning</p> <ul style="list-style-type: none"> • speed (1) - faster than human application (1) <p>materials - supply and control</p> <ul style="list-style-type: none"> • cost control (1) - by less waste/faulty parts (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p>processing/production</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • competitiveness (1) - faster rates of production (1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>assembly/finishing</p> <ul style="list-style-type: none"> • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes(1) • product consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) <p>packaging/dispatch</p> <ul style="list-style-type: none"> • packaging consistency (1) - by control of processes (1) • cost control (1) - by less waste/faulty parts (1) • efficiency (1) - by less waste/faulty parts (1) • speed (1) - faster than human application (1) • energy conservation (1) - by control of energy into process (1) • waste control (1) - by monitoring processes and quality control of processes (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
4(c)(iii)	<p>One mark for identifying disadvantage One mark for why</p> <p>Appropriate disadvantage to the manufacturer, eg</p> <ul style="list-style-type: none"> • High initial set-up costs • High cost of machinery and equipment • High maintenance costs • Machine downtime expensive <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(a)	<p>One mark for identifying the use One mark for the description</p> <ul style="list-style-type: none"> • use of CNC lathe (1) for turning the product (1) • use of CNC miller (1) for milling the product (1) • use of Laser Cutter (1) for cutting or engraving the product (1) • use of CNC drill (1). to produce holes in the product (1) • use of CNC router (1) to cut and shape the product (1) • use of rapid prototyping machine(1) to model the product(1) • Any appropriate CAM machine <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(i)	<p>One mark for identifying each benefit up to a maximum of two</p> <ul style="list-style-type: none"> • more consistent products (1) • lower purchase price (1) • shorter order times (1) • better quality/accurate product (1) • customer satisfaction (1) • consistent product (1) • product guarantee (1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
5(b)(ii)	<p>One mark for identifying each benefit One mark for how</p> <ul style="list-style-type: none"> • Conversion from 2D to 3D (1) for modelling (1) • Quicker development time (1) through simulation • Easy to make modifications/edit/change (1) no paper hard copies (1)/computer data (1) • Lower initial development x costs (1) concurrent design processes (1) • Easy storage of data/information and retrieval (1) interaction with databases (1) • Accurately drawn (1) entry of accurate data or sizes (co-ordinates) (1) <p>Do not accept 'easier' without explanation. (4 x 1)</p>	(4)

Question Number	Answer	Mark
6(a)	<p>The application of technology to transfer/manipulate information (1) from/around one source to another (1). (2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(i)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Infrared/bluetooth • Messaging • Internet/wireless/Wi-fi • Video conferencing • Electronic point of sale (EPOS) • EDI • ISDN • Texting • Phone • Walkie talkie • Fax <p>Do not accept: TV, CAD, radio, computer/laptop/database or mobile phones/email (as in question) (1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(ii)	<p>One mark for the relevant example</p> <ul style="list-style-type: none"> • Books, journals, buyers guides, catalogues, brochures • Video conferencing - travel to central location • Electronic point of sale (EPOS) - stock taking, manual ordering, income calculations • EDI - postal documents • ISDN - analogue transmission • Texting - phone/conversation • Phone - telegrams • Fax - letters/memos/post <p>One mark for relevant example which must relate to the technology given in 6(b)(i). If part 6(b)(i) not answered no mark awarded.</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
6(b)(iii)	<p>One mark for identifying the advantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - flexibility (1) /roaming location (1) /cost (1) • Internet - immediate (1)/access to vast amount of information (1) • Video conferencing - no travel expenses (1)/less time wasted in travelling (1) • Electronic point of sale (EPOS) - faster (1)/more accurate (1) • EDI - immediate transfer of information (1)/no hard copies needed (1)/less storage space (1) • ISDN - more data transferred in parallel (1), quicker/easier (1) • Texting - stored record of transaction (1), quicker/easier (1) • Phone - immediate two way conversation (1) quicker/easier (1) • Fax - hard copy record (1), quick transfer data (1) <p>Other advantages may be seen in the light of: Speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced stock levels, reduced running costs, reduced lead times, calculation of sales, stock taking quicker/easier, storage space reduced or any other appropriate response.</p> <p>Advantages must relate to the manufacturer.</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
6(b)(iv)	<p>One mark for identifying the disadvantage One mark for the explanation</p> <ul style="list-style-type: none"> • Walkie talkie - poor quality (1) if out of range (1) • Internet - can be slow (1) when very busy (1) • Video conferencing - can be unreliable (1) signal quality can be poor (1) • Electronic point of sale (EPOS) - can be unreliable (1) sometimes does not recognise codes (1) • EDI - cost (1) of installing new equipment (1) • ISDN - cost (1) installing new line/equipment (1) • Texting - limited service (1) cannot send large data files (1) • Phone - communication not always private (1) crossed lines/phone tapping (1) • Fax - information fades (1) if not copied (1) <p>Any other appropriate response. Disadvantages must relate to the manufacturer. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(a)	<p>Appropriate description of CIM up to 2 marks such as:</p> <ul style="list-style-type: none"> • CIM is a method of manufacturing in which the entire production process (1) is controlled by computer (1) • CIM integrates (1) the use of all different functions of computers (1) in a company • CIM uses a flexible design and manufacturing system (1) where the factory can be quickly changed to produce different products (1) • Uses Product Development Management (PDM) systems (1) to manage concurrent design and manufacture (1) • Involves the use of CAD, CAM, modelling and simulation, sensors (1) in manufacturing control, CAD/CAM, automation and robotics (1) <p>Any other appropriate response. (2 x 1)</p>	(2)

Question Number	Answer	Mark
7(b)	<p>One mark for identifying the benefit One mark for explanation</p> <ul style="list-style-type: none"> • Fast and efficient (1) cost-effective manufacturing (1) • Concurrent manufacturing (1) faster time to market (1) • Efficient management of overall process (1) such as design/development, production planning, QC, materials supply and control (1) • Good communication links (1) between product development/production teams/suppliers and retailers (1) • Easy access to technical data/organisational information (1) by design and/or production team (1) • Reduction in product time to market (1) using JIT (1) <p>Any other appropriate response.</p> <p style="text-align: right;">(4 x 1)</p>	(4)

Section B

Question Number	Answer	Mark
8(a)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To support the weight of the cycles • To allow the bike frame to rest on the arms while being transported • To carry up to x amount of cycles on the back of the car • To ensure the bikes are supported whilst in motion <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(b)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To allow the cycle carrier to be attached to the car securely • To hook the cycle carrier onto the back of the car • To attach the cycle carrier to the car using the edges of the doors to secure it in place • The hooks attach to the straps that when pulled ensure that the cycle carrier is secure <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
8(c)	<p>An answer that makes reference to any of the following points:</p> <ul style="list-style-type: none"> • To protect the glass or paintwork from getting scratched during transport • To provide extra grip to prevent the carrier from moving during transport • To absorb the weight of the cycles during transport preventing damage to painted surfaces or glass <p>Answer must contain both notes and sketches. Max two marks if only notes or only sketches used. (3 x 1)</p>	(3)

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> • Materials supply and control/materials supply/materials control • Assembly and finishing/assembly/finishing <p>Must be in this order</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
9(a)(ii)	<ul style="list-style-type: none"> • Production/processing • Stage 5/stage five • 5/five <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
9(b)(i)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Development of the design brief (1) and design specification for the cycle carrier (1) • Listing design criteria (1) performance requirements (1) • Development of design ideas (1) and modelling using ICT (1) • Initial design ideas are produced (1) using CAD software (1) • Sketches are produced (1) by hand or using CAD software (1) • Modelling ideas (1) prototyping before manufacture (1) <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the design brief of the cycle carrier (1) would be developed by creating designs (1) by hand and using CAD software (1) to model the product prior to manufacture (1).</p>	(3)

Question Number	Answer	Mark
9(b)(ii)	<p>Appropriate descriptions including three of the following points:</p> <ul style="list-style-type: none"> • Scheduling production (1) • Converting order to production (1) • Materials requirements (1) • Labour requirements (1) • Deadlines (1) • Throughputs (1) • Machinery/equipment requirements (1) • Quality checks (1) • Control points (1) • Health and safety (1) • Any other appropriate response <p style="text-align: right;">(3 x 1)</p> <p>eg the stage where the manufacturer decides how the product is going to be made (1), what materials are needed (1) and what processes will be used during manufacturing (1).</p>	(3)

Question Number	Answer	Mark
10(a)(i)	<p>Specific materials used for the cycle carrier</p> <ul style="list-style-type: none"> • Steel/low carbon steel/chrome steel/mild steel/stainless steel • aluminium/aluminium alloy • brass <p>Do not accept polymer/plastic/metal/alloy</p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
10(a)(ii)	<p>one mark for improvement one mark for how</p> <ul style="list-style-type: none"> • good surface finish (1) prevents damage to paintwork (1) • easy to apply(1) good wear resistance (1) • Low maintenance requirements (1) relatively easy to re-apply(1) <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(b)	<p>Appropriate explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • Cost per unit is low • Complex shapes can be produced easily • Products have consistent quality • Rubber pads can be mass produced easily • Easy to automate <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(c)	<p>Any two of the following:</p> <ul style="list-style-type: none"> • drilling • turning • grinding • injection moulding • hardening/surface hardening • annealing/normalising • crimping • polishing/coating/painting/powder coating/plating • piercing/blanking • bending <p>Do not accept generic answers, ie 'cutting' or 'moulding' one mark per response up to two</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
10(d)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • Improved wear resistance/reliability • Longer lasting parts such as the gutter hooks • Moving products needed less maintenance • Easier manufacturing • Better functionality • More variation of products • Improved aesthetics • Smaller components/product • Lighter product (low density material used) <p>eg modern materials come in a range of colours and/or finishes (1), that are lightweight (1) and easily shaped (1) but still maintain their strength (1) to support the bikes whilst touring (1).</p> <p style="text-align: right;">(3 x 1)</p>	(3)

Question Number	Answer	Mark
11(a)	<p>Systems/processes/methods (1) used to ensure that products or services are designed and produced to meet or exceed customer requirements (1).</p> <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
11(b)(i)	<p>One mark for identifying QC procedure One mark for how</p> <ul style="list-style-type: none"> • Co-ordinate Measurement Machine (CMM) (1) • Optical sensors (1) • Inspection (1) and Testing (1) • Control charts (1) • Use control charts (1) to analyse data (1) • Data from probes (co-ordinate measurement machine CMM)(1)/optical sensors (1) is directly inputted into a computer system (1) and reports can be generated (1) • Inspection of components (1) in order to function properly (1) acceptable in accordance with its specification (1) and external standards (BS, EN ISO) (1) <p style="text-align: right;">(2 x 1)</p> <p>Must have relevant monitoring/control technology link</p>	(2)

Question Number	Answer	Mark
11(b)(ii)	<p>One mark for identifying QC procedure One mark for how</p> <ul style="list-style-type: none"> • Reduced customer complaints (1) - better products (1) • Control of costs (1) - cheaper product/more profit (1) • Avoids faulty parts being assembled (1) - early detection (1) • Increased sales (1) - consistent products/lower prices (1) • User confidence (1) - consistent product/less returns (1) • Reduced waste (1) - control of manufacturing process (1) • Made to same quality standard (1) • Reliable product (1) - monitoring standards testing/parts (1) • Ergonomically safe (1) and comfortable to use (1) • No breaking parts (1) - monitoring component/parts • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark.</p>	(2)

Question Number	Answer	Mark
11(b)(iii)	<p>One mark for identifying benefit One mark for how</p> <ul style="list-style-type: none"> • Safer product to use (1) - confidence in product reliability (1) • Consistent product (1) - ensures standards are met (1) • Longer useable life (1) - don't have to buy so often (1) • Product reliability (1) - confidence in the company (1) • Lower prices (1) - less scrap/waste/more efficient (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p> <p>If no answer or inappropriate answer is given in part 11(b)(i) allow follow through up to 1 mark.</p>	(2)

Question Number	Answer	Mark
11(c)	<p>References to both open and closed systems required</p> <ul style="list-style-type: none"> • Open loop - does not use feedback to check the quality of the system • Open Loop - does not use feedback to determine if the input has achieved the desired goal • Open Loop - used in simple processes where low cost is important and feedback is not essential • Closed loop - uses feedback in order to make decisions about necessary changes • Closed loop - respond to changes as a result of feedback • Closed loop - used where greater accuracy and quicker response times are required <p style="text-align: right;">(4 x 1)</p>	(4)

Question Number	Answer	Mark
12(a)(i)	<p>One mark for the description One mark for how</p> <p>Description of use of ICT such as:</p> <ul style="list-style-type: none"> • Word processing of reports (1) during product development to aid evaluative process (1) • Using 3D modelling techniques to design and modify the cycle carrier (1) and calculate quantity of materials required for manufacture (1) • Storage of information (1) range of types of cycle carriers/components/parts (1) and information in database and/or spreadsheets(1) • Use CAD modelling (1) of components (1) for different shapes/assemblies (1) • Create and modify design ideas (1) • Producing drawings (1) of component parts (1) and assembly of cycle carriers (1) • Presenting virtual products to clients (1) • Making accurate working drawings (1) manufacturing specifications (1) • Develop 3D images (1) • Produce cutting lists (1) for a range of sizes (1) • Send CAD information to client via email/internet (1) for approval (1) • Or similar <p style="text-align: right;">(2 x 1)</p> <p>Accept any appropriate software, eg Pro Desktop, 2D Design. No type of ICT named - no marks</p>	(2)

Question Number	Answer	Mark
12(a)(ii)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • Product information available for the whole design team • Speed and efficiency of modelling • Speed and efficiency of modification of ideas • Ease/speed of creating virtual products on screen • Speed of decision making by client • Easy access to existing components in company database • Efficiency of costing materials and using lay plans that minimise waste • Or similar <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(i)	<p>One mark for identifying the use One mark for how</p> <ul style="list-style-type: none"> • Use of bar coding (1) to monitor packaging/dispatch of cycle carriers (1) • Labelling systems (1) to electronically tag cycle carriers (1) • Automation processes (1) to assist with product packaging and sealing (1) • Robotics (1) to transport products to dispatch areas (1) • Any other appropriate response <p style="text-align: right;">(2 x 1)</p>	(2)

Question Number	Answer	Mark
12(b)(ii)	<p>One mark for identifying the advantage One mark for how</p> <ul style="list-style-type: none"> • Fast time to market (1) • Ease of tracking products (1) during delivery (1) • Ease of tracking products (1) on the premises (1) • Less manual labour required (1) • Robots can transport heavy items (1) • Reliability of tracking systems (1) • Any other appropriate response <p style="text-align: right;">(2 x 1) (2 x 1)</p> <p>No repeats</p>	(4)

Question Number	Answer	Mark
13	<p>An evaluation that makes reference to a combination of four of the following advantages and disadvantages to a maximum of four marks:</p> <p>Possible advantages:</p> <ul style="list-style-type: none"> • Reduced lead times (1) • Orders materials (1) • More choice available (1) • New technologies and materials create demand from innovative customers (1) • Control of stock levels easier and more accurate (1) • Just-in-time supply can be managed (JIT) (1) • Superior quality product produced (1) • Any other appropriate response <p>Possible disadvantages:</p> <ul style="list-style-type: none"> • Old design products become obsolete quicker (1) • Staff training costs (1) • Maintenance costs (1) • Possible over-reliance/risk of system failure (1) • Any other appropriate response <p style="text-align: right;">(4 x 1)</p> <p>Any combination of advantages and disadvantages up to 4 marks. A maximum of 3 marks if only advantages or disadvantages.</p>	(4)

Question Number	Indicative content	
14 QWC i, ii, iii	<p>Discussion to address the following issues:</p> <ul style="list-style-type: none"> • <i>Issue</i> - Modern processes are highly automated; <i>Development</i> - so require a lot of electricity, or other forms of energy, to operate them • <i>Issue</i> - Modern processes are developing to replace work undertaken manually at present; <i>Development</i> - leading to further automation • <i>Issue</i> - Modern processes require more equipment/machinery/tooling; <i>Development</i> - leading to higher energy consumption earlier in the supply chain • <i>Issue</i> - Modern processes are most efficient at higher volumes; <i>Development</i> - leading to higher production rates and therefore overall energy consumption increases • <i>Issue</i> - Efficient modern processes may lead to a reduction in costs, meaning lower prices; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The use of efficient modern processes may lead to economic wealth; <i>Development</i> - which increases overall demand for products and leads to increased overall energy use • <i>Issue</i> - The complexity of modern processes may lead to specialisation and production being concentrated in a particular area of the world; <i>Development</i> - leading to increased energy use for transportation <p>Or other appropriate answer</p>	
Level	Mark	Descriptor
	0	No material deserving of reward.
1	1-2	Candidate identifies the issue(s) with no development OR identifies and develops one issue. Shows limited understanding of the issues. The student uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy.
2	3-4	Candidate identifies some issues with associated developments showing some understanding of the issues. The student uses some technological/engineering terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found.
3	5-6	Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues, including those associated with the inconsistency between efficiency and consumption. The student uses a range of appropriate technological/engineering terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar used with considerable accuracy.

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