

Write your name here

Surname

Other names

**Pearson**  
**Edexcel GCSE**

Centre Number

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Candidate Number

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**Manufacturing (Double Award)**  
**Engineering (Double Award)**  
**Unit 3: Application of Technology in Engineering**  
**and Manufacturing**  
**Paper D: Engineering Fabrication**

Tuesday 19 May 2015 – Morning  
**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

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### 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.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed  
– *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

### Advice

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

Turn over ►

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**PEARSON**

## SECTION A

Answer ALL questions.

Some questions must be answered with a cross . 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 the products listed below belong to a manufacturing 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 <b>two</b> boxes below
Barbeque	<input type="checkbox"/>
Smartphone	<input type="checkbox"/>
Baking powder	<input type="checkbox"/>
Rucksack	<input type="checkbox"/>
Garage door	<input type="checkbox"/>
Textbook	<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 <b>two</b> boxes below
Swimming costume	<input type="checkbox"/>
Manhole cover	<input type="checkbox"/>
Duvet cover	<input type="checkbox"/>
Tin snips	<input type="checkbox"/>
Production plan	<input type="checkbox"/>
Business card	<input type="checkbox"/>

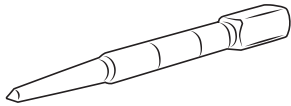
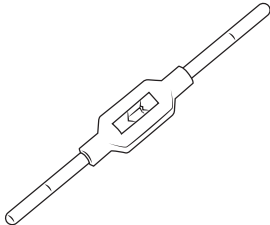
(Total for Question 1 = 4 marks)



2 The tables below show some tools and equipment used during the manufacture of engineering fabrication products.

(a) Complete Table 1 by naming each tool.

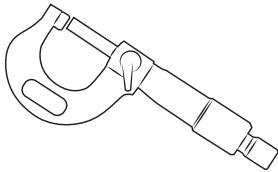
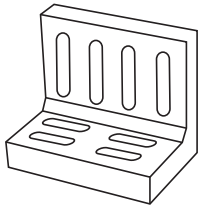
(2)

Tool	Tool name	Use
		Used to mark out hole positions prior to drilling.
		Used to hold a tool when cutting internal threads.

**Table 1**

(b) Complete Table 2 by explaining the use of each piece of equipment.

(4)

Equipment	Equipment name	Use
	Micrometer	
	Angle plate	

**Table 2**

**(Total for Question 2 = 6 marks)**



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

Each Key Area can be used more than once.

**Term**

**Key Area**

Ceramics

Presentation software

Polystyrene

Automation systems

Stainless steel

Wi-Fi

Computer-integrated  
engineering (CIE)

Modern materials

Control technology

Information and  
communications  
technology (ICT)

**(Total for Question 3 = 7 marks)**



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**4** Bicycle hand pumps belong to the engineering fabrication sector and use modern materials in their manufacture.

(a) Name **two** other products from this sector that use modern materials in their manufacture.

(2)

Product 1

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Product 2

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

(1)

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

(4)

1 .....

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2 .....

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(c) (i) State **one** smart material used in the engineering fabrication sector.

(1)

(ii) Briefly describe the features of the smart material you named in 4(c)(i).

(2)

**(Total for Question 4 = 10 marks)**



5 Communications technology is widely used by manufacturers of engineering fabrication products. The internet is an example of communications technology.

(a) (i) Using an example, describe the term **internet**.

(3)

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(ii) Explain **one** disadvantage to a manufacturer of using the internet.

(2)

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(b) (i) Name **one** example, other than the internet, of a communications technology.

(1)

.....

(ii) Explain **one** benefit to the distributor of using the example named in 5(b)(i).

(2)

.....

.....

.....

.....

**(Total for Question 5 = 8 marks)**





**6** Robotics and computer-integrated manufacturing systems (CIM) are used increasingly in engineering fabrication companies.

(a) (i) State **one** way in which robots may be used when manufacturing an engineering fabrication product.

(1)

.....

.....

(ii) Explain **two** disadvantages to an engineering fabrication manufacturer of using robotics.

(4)

1 .....

.....

.....

2 .....

.....

.....

(b) Describe **two** main features of a CIM system.

(4)

1 .....

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2 .....

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**(Total for Question 6 = 9 marks)**



**7** Handling information and data is an essential feature in engineering fabrication companies.

(a) Describe how a manufacturer would use production planning and scheduling information at the materials supply and control stage.

(4)

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(b) Explain **one** way that the use of information and data handling systems would benefit the manufacturer when marketing and selling products.

(2)

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**(Total for Question 7 = 6 marks)**

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**TOTAL FOR SECTION A = 50 MARKS**



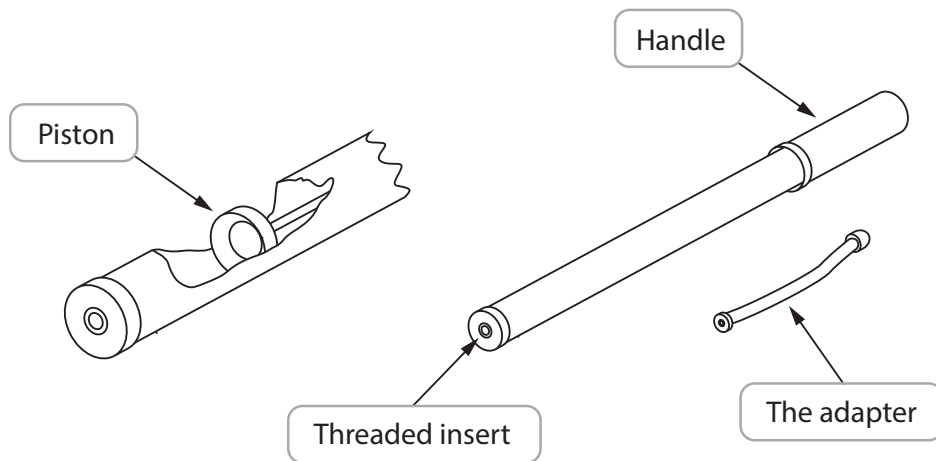
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## SECTION B

**Answer ALL questions in section B with reference to the manufacture of mass produced bicycle hand pumps.**

The diagram below shows a bicycle hand pump.



**8** Describe, using notes and sketches:

(a) the function of the adapter

(3)

adapter

(b) the function of the handle

(3)

handle



(c) the function of the piston.

(3)

piston

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**(Total for Question 8 = 9 marks)**



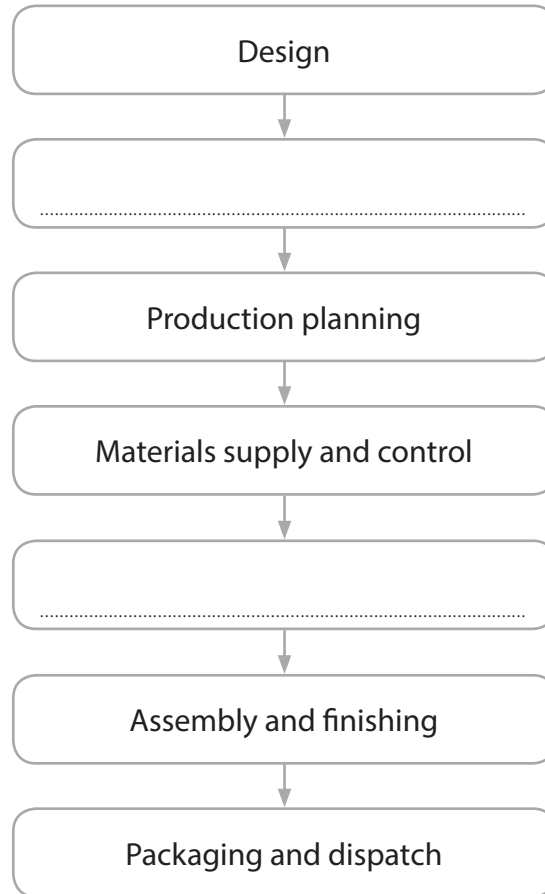
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9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing bicycle hand pumps.

(i) Complete the flow diagram by adding the **two** missing stages in the manufacture of bicycle hand pumps.

(2)



(ii) State the stage in manufacturing where the handle is attached to the piston tube.

(1)

Stage

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(b) List **three** activities carried out at the design stage when manufacturing bicycle hand pumps.

(3)

- 1 .....
- 2 .....
- 3 .....

(c) Describe the packaging and dispatch stage when manufacturing bicycle hand pumps.

(3)

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**(Total for Question 9 = 9 Marks)**



10 (a) State a specific material commonly used for the threaded insert of the bicycle hand pump. (1)

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(b) The threaded insert has been manufactured using a computer numerical control (CNC) machining process.

(i) State **three** production processes, other than CNC machining, used during the manufacture of the bicycle hand pump. (3)

Process 1

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Process 2

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Process 3

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(ii) Explain why CNC machining is a suitable process to use during the manufacture of bicycle hand pumps. (3)

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(c) Explain why thermoplastic materials are appropriate for the handle of the bicycle hand pump.

(3)

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**(Total for Question 10 = 10 marks)**



**11** Control technology plays an important role in the manufacture of bicycle hand pumps.

(a) (i) State **two** uses of control technology during assembly and finishing.

(2)

- 1 .....
- 2 .....

(ii) Describe **two** ways in which control technology is used when producing bicycle hand pumps.

(4)

- 1 .....
- .....
- .....
- .....
- 2 .....
- .....
- .....
- .....

(b) Describe **three** benefits to the manufacturer of using computer controlled production.

(6)

- 1 .....
- .....
- .....
- .....
- 2 .....
- .....
- .....
- .....
- 3 .....
- .....
- .....
- .....

**(Total for Question 11 = 12 marks)**



**12** A manufacturer of bicycle hand pumps has decided to change its production methods so that it follows lean manufacturing principles.

(a) (i) Explain the term **lean manufacturing**.

(2)

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(ii) Describe **two** advantages lean manufacturing could have for the distributor of bicycle hand pumps.

(4)

1 .....

.....

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2 .....

.....

.....



(b) Changing to lean manufacturing methods will have an impact on the global environment and on the manufacturer's workforce.

(i) State **two** reasons why using lean manufacturing could have a positive effect on the global environment.

(2)

1 .....

.....

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2 .....

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(ii) Explain **one** benefit that this change could have on the workforce.

(2)

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**(Total for Question 12 = 10 marks)**

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**13** Bicycle hand pumps are manufactured from a variety of materials.

Discuss how a manufacturer can process these materials sustainably.

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**(Total for Question 13 = 4 marks)**

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