Write your name here

Surname		Other names

**Pearson
Edexcel GCSE**

Centre Number

Candidate Number

Manufacturing (Double Award)
Engineering (Double Award)

Unit 3: Application of Technology in Engineering
             and Manufacturing
Paper F: Mechanical/Automotive

Tuesday 24 May 2016 – Morning
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.*
- 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 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 **mechanical** sector.

(2)

Products	Put a cross in **two** boxes below
Metal spade	⊠
Rivet	⊠
Hairdryer	⊠
Bottled water	⊠
A4 diary	⊠
Mustard	⊠

   (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
Bluetooth speaker	⊠
Bus ticket	⊠
Trolley jack	⊠
Pizza cutter	⊠
Allen key	⊠
Dishwasher powder	⊠

(Total for Question 1 = 4 marks)

2
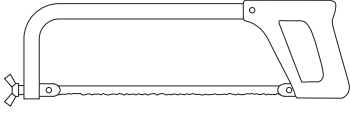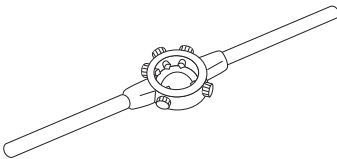
2 The tables below show some tools and equipment used during the manufacture of mechanical/automotive products.

(a) Complete Table 1 by naming each tool.
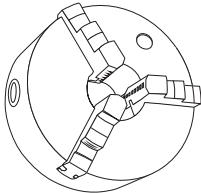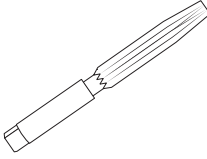
(2)

Tool	Tool name	Use
		Used primarily to cut metal using a fine toothed blade.
		Used to hold a cutting tool for external threads.

Table 1

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

(4)

Equipment	Equipment name	Use
	Three-jaw chuck	
	Hand reamer	

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

Thermostat

Voice over internet protocol

Modern materials

Copper

Cast iron

Control technology

Programmable logic controllers (PLCs)

Ceramics

Information and communications technology (ICT)

Video conferencing

(Total for Question 3 = 7 marks)

4 3 to 32mm diameter tube cutters belong to the mechanical/automotive sector and use a turning process and automation in their manufacture.

(a) Name **two** other products from this sector that use a turning process and automation in their manufacture.

(2)

Product 1

....

Product 2

....

(b) (i) Name a type of material removal process, apart from turning, used in the manufacture of a product you named in 4(a).

(1)

....

(ii) Describe the turning process used in the manufacture of a product you named in 4(a).

(3)

....

....

....

....

....

(c) Describe **two** examples of automation used in the manufacture of a product you named in 4(a).

(4)

1 ....

....

....

2 ....

....

....

....

(Total for Question 4 = 10 marks)

5 Computer-aided design (CAD) and computer-integrated manufacturing (CIM) are both used by manufacturers of mechanical/automotive products.

(a) State **two** functions of a computer-aided design (CAD) system.

(2)

1 ....

....

2 ....

....

(b) A manufacturer has changed from using traditional design methods to computer-aided design (CAD).

Describe **one** disadvantage of this change for the manufacturer.

(2)

....

....

....

....

(c) State **two** functions of a computer-integrated manufacturing (CIM) system.

(2)

1 ....

....

2 ....

....

(d) Explain **one** benefit of linking computer-aided design (CAD) and computer-integrated manufacturing (CIM) for the manufacturer.

(2)

....

....

....

....

(Total for Question 5 = 8 marks)

6 Information and data are important to manufacturers.

(a) (i) Describe the term **database**.

(3)

....

....

....

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

(2)

....

....

....

(b) Explain **two** reasons why a manufacturer would use an electronic spreadsheet.

(4)

1 ....

....

....

....

2 ....

....

....

....

(Total for Question 6 = 9 marks)

7 Communications technology is an essential feature in mechanical/automotive companies.

(a) Explain **one** benefit of using communications technology on the global environment.

(3)

....

....

....

....

....

....

....

(b) Other than environmental benefits, explain **one** advantage of using communications technology when marketing a product.

(3)

....

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....

....

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....

....

(Total for Question 7 = 6 marks)

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 3 to 32mm diameter tube cutters.

The diagram below shows a 3 to 32mm diameter tube cutter.

Knob

Main body

Thread

Moving jaw

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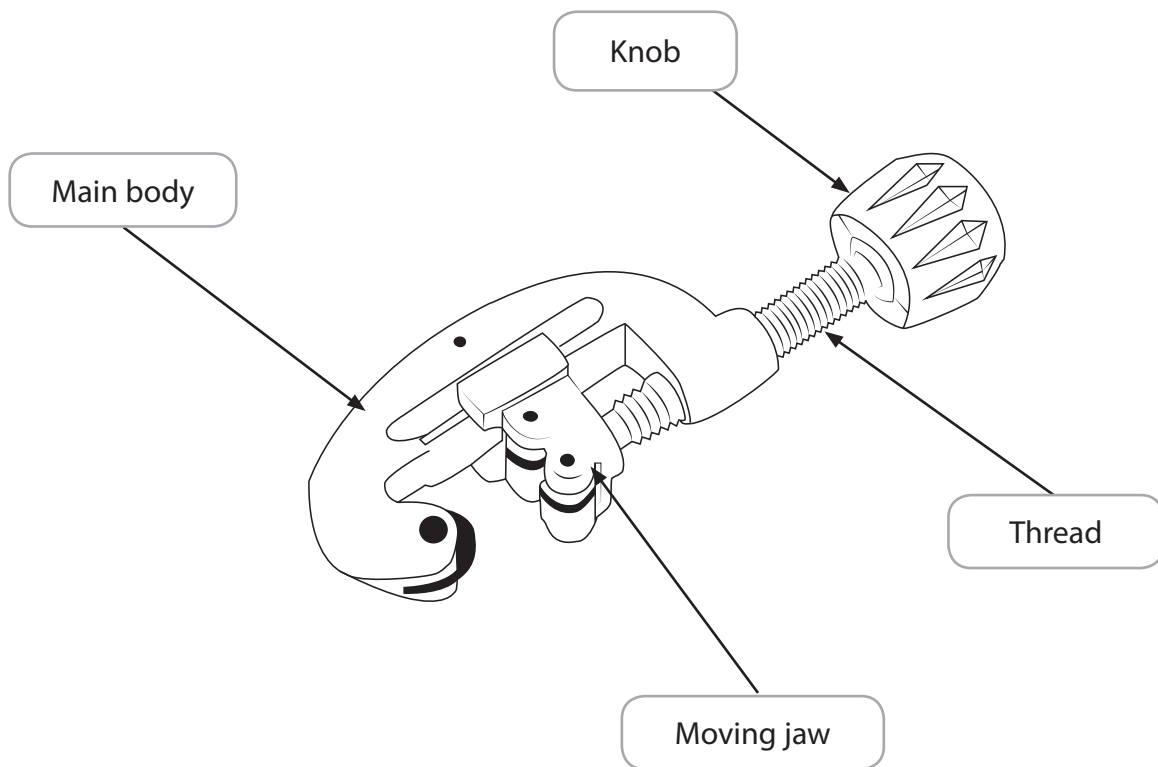
8 Describe, using notes and sketches:

(a) the function of the thread.

(3)

thread

(b) the function of the moving jaw.

(3)

moving jaw

(c) the function of the knob.

(3)

knob

(Total for Question 8 = 9 marks)

9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing 3 to 32mm diameter tube cutters.

(i) Complete the flow diagram by adding the **two** missing stages in manufacturing 3 to 32mm diameter tube cutters.

(2)

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┌─────────────────────────────────┐
│ .............................  │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│            Marketing             │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│       Production planning        │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│    Materials supply and control  │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│     Processing and production    │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│ .............................  │
└─────────────────────────────────┘
              │
              ▼
┌─────────────────────────────────┐
│      Packaging and dispatch      │
└─────────────────────────────────┘
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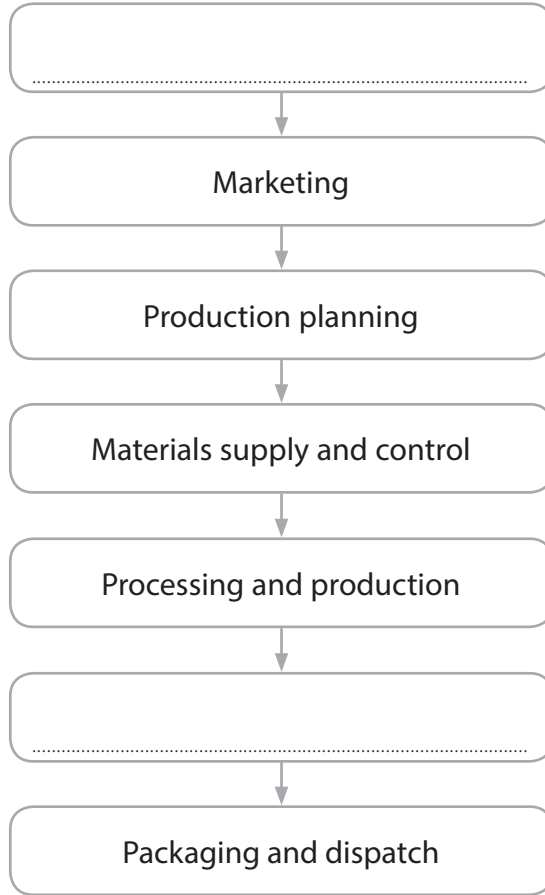
(ii) State the stage in manufacturing where the 3 to 32mm diameter tube cutters are advertised.

(1)

Stage ....

(b) List **three** activities carried out at the production planning stage when manufacturing 3 to 32mm diameter tube cutters.

(3)

1 ....

2 ....

3 ....

P 4 6 5 3 7 A 0 1 3 2 0

(c) Describe the materials supply and control stage when manufacturing 3 to 32mm diameter tube cutters.

(3)

....

....

....

....

....

(Total for Question 9 = 9 marks)

10 (a) State a specific material commonly used in the manufacture of the following parts of the 3 to 32mm diameter tube cutter.

(i) the main body

(1)

....

(ii) the knob

(1)

....

(iii) the thread

(1)

....

(b) The main body is shaped using die casting.

(i) State **one** other shaping process, other than die casting, used during the manufacture of 3 to 32mm diameter tube cutters.

(1)

Process

....

(ii) Explain why die casting is a suitable process to use during the manufacture of the main body.

(3)

....

....

....

....

....

....

(c) Explain how the use of modern materials can reduce wastage when producing 3 to 32mm diameter tube cutters.

(3)

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....

....

....

(Total for Question 10 = 10 marks)

11 Computer-aided manufacture (CAM) and quality control are used in the manufacture of 3 to 32mm diameter tube cutters.

(a) State **two** reasons why computer-aided manufacture (CAM) is used at the packaging and dispatch stage.

(2)

1 ....

2 ....

(b) Describe **three** quality control procedures carried out at the packaging and dispatch stage.

(6)

1 ....

....

....

2 ....

....

....

3 ....

....

....

(c) Explain **two** benefits of using quality control at the packaging and dispatch stage.

(4)

1 ....

....

....

2 ....

....

....

(Total for Question 11 = 12 marks)

P 4 6 5 3 7 A 0 1 7 2 0

12 The introduction of modern technology and modern materials in the manufacture of mass produced 3 to 32mm diameter tube cutters has brought changes.

(a) (i) State **two** different changes the introduction of modern technology has had on the workforce.

(2)

1 ....

....

2 ....

....

(ii) Explain **two** different effects the introduction of modern technology has had on the working environment.

(4)

1 ....

....

....

2 ....

....

....

(b) Explain **two** different benefits modern materials have had on product characteristics and sales.

(4)

1 ....

....

....

2 ....

....

....

(Total for Question 12 = 10 marks)

P 4 6 5 3 7 A 0 1 8 2 0

13 Control technology is an essential feature in the manufacture of 3 to 32mm diameter tube cutters.

Explain the impact of control technology on safety.

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(Total for Question 13 = 4 marks)

*14 Manufacturers of mechanical/automotive products are increasingly using robotics.

Discuss the impact of robotics on production efficiency, product quality and manufacturing costs.

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(Total for Question 14 = 6 marks)

TOTAL FOR SECTION B = 60 MARKS
TOTAL FOR PAPER = 110 MARKS

P 4 6 5 3 7 A 0 2 0 2 0