Write your name here

Surname	Other names

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

Monday 16 May 2011 – Afternoon
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** 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.*
- 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.
- 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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P 3 8 8 3 7 A 0 1 2 4

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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)

Supermarket receipt	☒
Perfume	☒
Door hinge	☒
Fire guard	☒
Business card	☒
Computer mouse	☒

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

(2)

Table cloth	☒
Anti-freeze tester	☒
Hardwood decking board	☒
Rollerball pen	☒
Welding hearth	☒
Trolley jack	☒

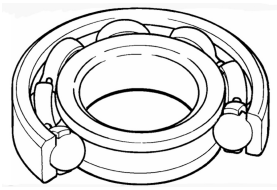
(Total for Question 1 = 4 marks)

2 The tables below show some components used in the manufacturing of mechanical/ automotive products.

(a) Complete Table 1 by naming each component.

(2)

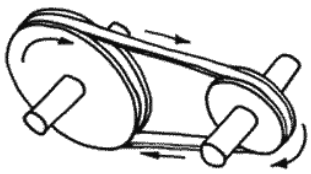
Table 1

Component	Component name	Use
		Used to reduce the friction between a rotating component and a stationary component.
		Used to transfer and reverse rotary motion from one shaft to another and may change the speed.

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

(4)

Table 2

Component	Component name	Use
	Pulley and belt system	
	Solid 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
Bluetooth	
Robotics	Modern materials
Polypropylene (PP)	
Sintered metals	Control technology
Video conferencing	
Computer aided manufacture (CAM)	Information and communications technology (ICT)
Polyvinyl chloride (PVC)	

(Total for Question 3 = 7 marks)

4 Metal cased drill sets belong to the mechanical/automotive sector.

(a) Name **two** other products from this sector, apart from metal cased drill sets, that utilise modern materials in their manufacture.

(2)

1 .....

2 .....

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

(1)

.....

(ii) Explain **two** benefits to the **manufacturer** of using the modern material named in 4(b)(i).

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(c) (i) State **two** smart materials used in the mechanical/automotive sector.

(2)

1 .....

2 .....

(ii) Describe the characteristics of **one** smart material named in 4(c)(i).

(2)

.....

.....

.....

.....

(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 why a **manufacturer** would use CAD rather than traditional methods.

(2)

.....

.....

.....

.....

(b) (i) State **two** benefits to the **manufacturer** of using CAM.

(2)

1 .....

.....

2 .....

.....

(ii) Explain **two** benefits to the **distributor** when the manufacturer uses CAD and CAM.

(4)

1 .....

.....

.....

2 .....

.....

.....

(Total for Question 5 = 8 marks)

6 Systems and control technologies are widely used by manufacturers of mechanical/ automotive products.

(a) Explain the term 'systems and control technology'.

(2)

.....

.....

.....

.....

(b) Robotics is an example of a systems and control technology.

(i) Name **one** other example of a systems and control technology.

(1)

.....

.....

(ii) Name the traditional method this has replaced.

(1)

.....

.....

(iii) Explain **two** benefits of using robotics in hazardous conditions.

(4)

1 .....

.....

.....

2 .....

.....

.....

(Total for Question 6 = 8 marks)

7 Handling information and data is an essential feature in mechanical/automotive companies.

Explain **one** implication that information and data handling systems have for:

(a) marketing

(3)

(b) materials supply.

(3)

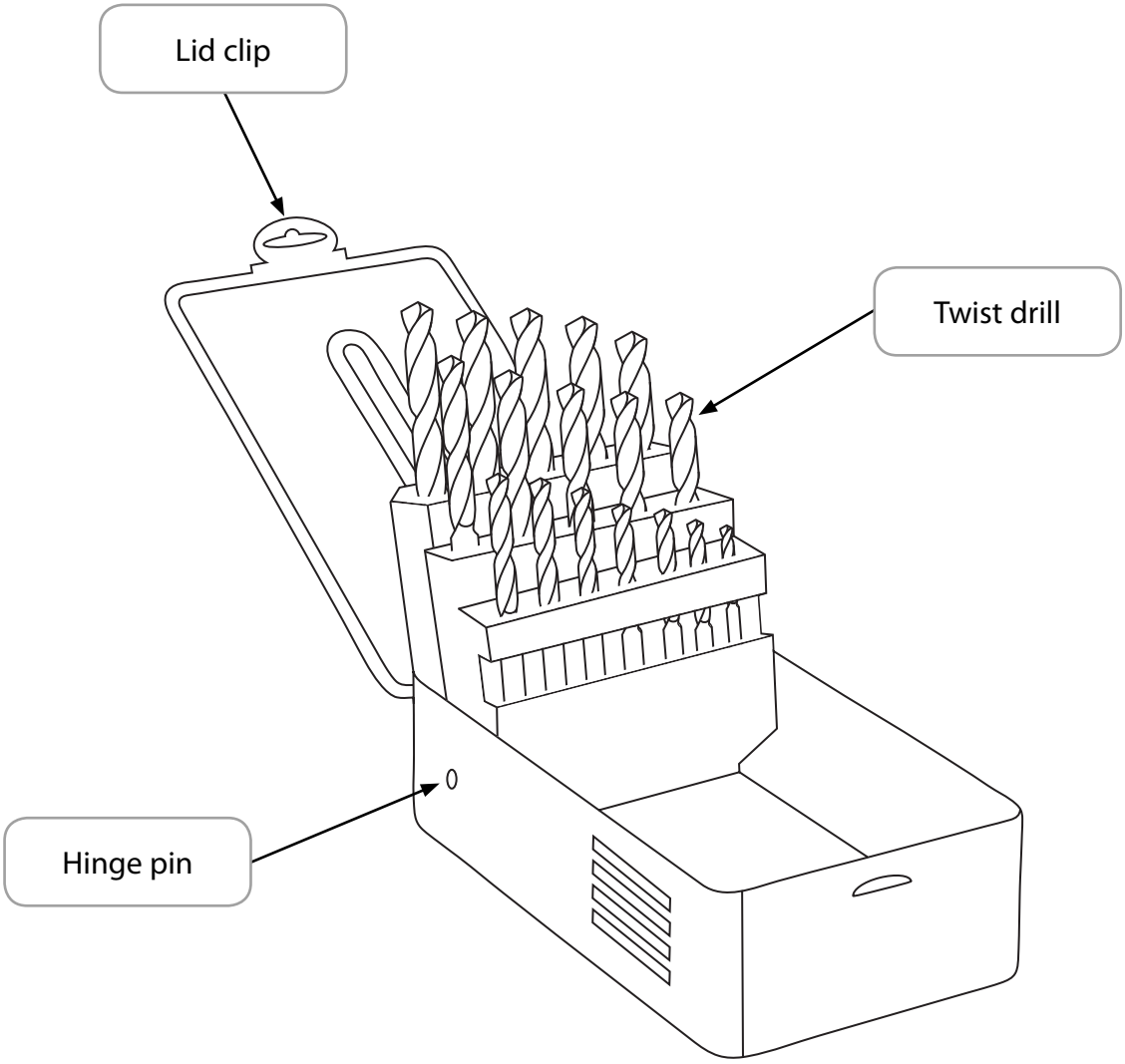
(Total for Question 7 = 6 marks)

TOTAL FOR SECTION A = 50 MARKS

SECTION B

Answer ALL questions in Section B with reference to the manufacture of mass produced metal cased drill sets.

The diagram below shows a **metal cased drill set**.



8 Describe, using notes and sketches:

(a) the function of the lid clip

(3)

Lid clip

(b) the function of the hinge pin

(3)

Hinge pin

(c) the function of the twist drill.

(3)

Twist drill

(Total for Question 8 = 9 marks)

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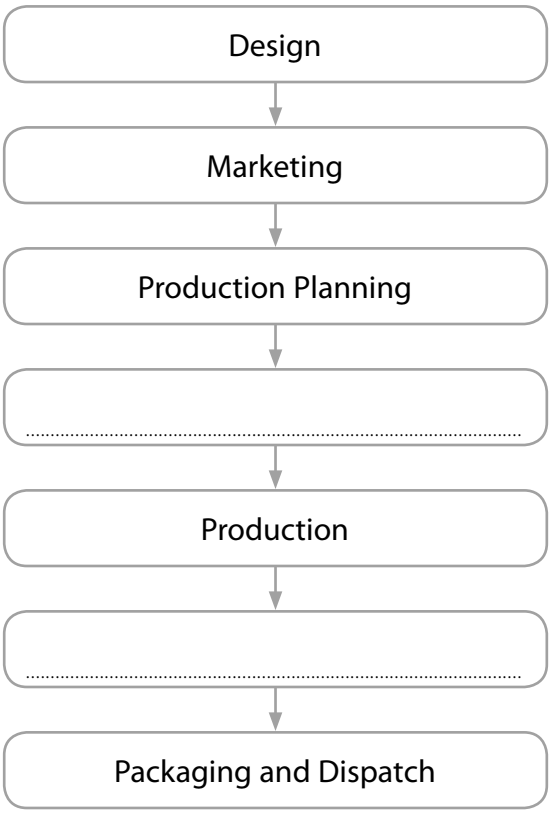
9 (a) The incomplete flow diagram below indicates some of the main stages in manufacturing metal cased drill sets.

(i) Complete the flow diagram by writing the **two** missing main stages in manufacturing metal cased drill sets.

(2)



(ii) State the stage where the metal cased drill sets would be advertised on websites.

(1)

Stage

.....

(b) Describe the following **two** stages in the manufacture of metal cased drill sets.

(3)

(i) Production planning

(ii) Packaging and dispatch

(3)

(Total for Question 9 = 9 marks)

10 (a) State a specific material commonly used for the cutting edge of the twist drill.

(1)

.....

.....

(b) Heat treatment is used to refine the surface of the twist drills in metal cased drill sets.

(i) State **three** production processes, other than heat treatment, used during the manufacture of metal cased drill sets.

(3)

Process 1

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Process 2

.....

Process 3

.....

(ii) Explain why heat treatment is a suitable process for refining the surface of the twist drill.

(3)

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(c) Explain how the use of modern materials has helped the manufacturer of metal cased drill sets to increase sales.

(3)

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(Total for Question 10 = 10 marks)

11 Automation is used in the manufacture of metal cased drill sets.

(a) Explain the term 'automation'.

(2)

(b) (i) Describe **two** examples of automation used at the production stage of the manufacture of metal cased drill sets.

(4)

1

2

(ii) Explain **one** benefit to the **manufacturer** of applying a type of automation described in 11(b)(i).

(2)

(iii) Explain **one** benefit to the **consumer** of applying a type of automation described in 11(b)(i).

(2)

(c) Explain the difference between automation and mechanisation.

(2)

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(Total for Question 11 = 12 marks)

12 Communications technology and quality control play an important role in the manufacture of metal cased drill sets.

(a) (i) State **two** types of communications technology used at the **design** stage when manufacturing metal cased drill sets.

(2)

1 .....

2 .....

(ii) Using an example from 12 (a)(i), describe **one** benefit of the use of communications technology at the **design** stage.

(2)

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(b) During the manufacture of metal cased drill sets, physical damage quality checks are carried out.

(i) State **one** other quality check used during the **production** stage.

(1)

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(ii) Describe how the quality check stated in 12 (b)(i) would be carried out.

(2)

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(iii) Explain the benefits of the use of quality control to the metal cased drill set end user.

(3)

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(Total for Question 12 = 10 marks)

13 The utilisation of modern technology in the manufacture of metal cased drill sets has brought changes. Explain the effect of these changes for the workforce **and** the working environment.

(Total for Question 13 = 4 marks)

***14** Discuss the impact of the use of modern technologies on the sustainable manufacture of metal cased drill sets.

(Total for Question 14 = 6 marks)

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

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