

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	



General Certificate of Secondary Education
June 2014

Engineering

48501

Unit 1 Written Paper

Friday 23 May 2014 1.30 pm to 2.30 pm

For this paper you must have:

- normal writing and drawing instruments.

Time allowed

- 1 hour

Instructions

- Use black ink or black ball-point pen. Use pencil only for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.
- The questions in Section A relate to the context referred to in the preliminary material that was previously issued.
- You are reminded of the need for good English and clear presentation in your answers. Quality of Written Communication will be assessed in Question 1 (c).

A



J U N 1 4 4 8 5 0 1 0 1

M/SEM/104922/Jun14/E3

48501

Section A

Answer **all** questions from this section.

- 1 Throughout the development of bicycle design, the function of some components have remained the same. A picture of a bicycle is shown in **Figure 1**.

Figure 1



- 1 (a) In the spaces below, correctly describe the function of each labelled part.

[6 marks]

Crank/Pedal Assembly

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.....

.....

Handlebar

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.....

.....



Brake System

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

1 (b) A typical bicycle is shown in **Figure 2**.

Figure 2



1 (b) (i) Name a suitable specific material for **one** of the following wheel parts:

- Wheel rims
- Wheel spokes
- Wheel hubs.

[1 mark]

Wheel part

Suitable material

1 (b) (ii) Explain why the material you have chosen in part (b)(i) would be suitable for a bicycle wheel.

[2 marks]

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.....

Question 1 continues on the next page

Turn over ▶



Section B

Answer **all** questions from this section.

- 2** **Figure 3** shows a bicycle which is electrically powered.

Figure 3



Using notes and sketches in the space below, describe how an electrically powered bicycle could be controlled.

Marks will be awarded for:

- information in notes
- information in sketches.



[6 marks]

Turn over ▶



- 3 (a)** The table below shows equipment which may typically be used when manufacturing bicycle parts. Complete the table.

[4 marks]

	Equipment name	Equipment use
		
		



3 (b) Figure 4 shows a centre lathe.

Figure 4



Name **three** hazards to health and safety when using a centre lathe.
For each one suggest a suitable safety measure.

[6 marks]

Hazard 1

Safety measure

Hazard 2

Safety measure

Hazard 3

Safety measure

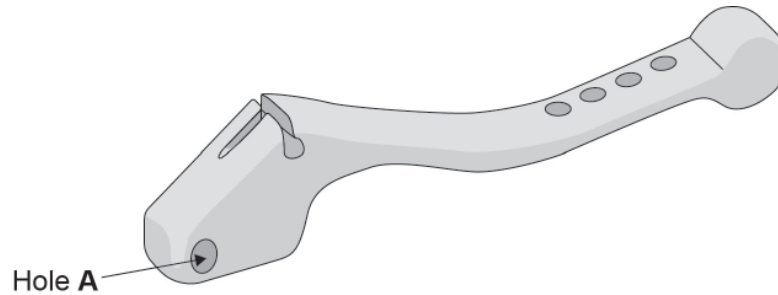
10

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- 4 **Figure 5** shows a brake lever from a bicycle. The lever is 12 mm wide and has an overall length of 125 mm. The pivot hole labelled **A** has a diameter of 6 mm.

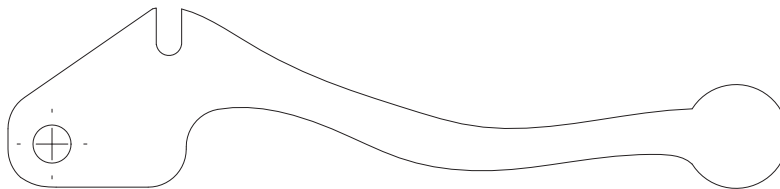
Figure 5



- 4 (a) Using standard conventions, add **two** dimensions to the drawing below.

[4 marks]

Figure 6



- 4 (b)** The table below lists six major operations to manufacture a brake lever. Complete the table by inserting the identification letter in the correct box. Choose from letters **A** to **J**.

[10 marks]

Order	Operation	Tools and Equipment	Description
1	Make the pattern	Coping/tenon saw, marking and measuring equipment, rasp, glass paper	
2	Cast the blank lever		
3	Machine the lever to correct size and tolerances		
4	Make holes for brake cable and ventilation		Secure workpiece in vice and drill holes
5	Deburr holes		
6	Finish surface		

Place lever into vice ensuring correct level. Remove excess material: **A**

Pillar drill
Countersink bit: **B**

Abrasive sheets and buffing wheel: **C**

Cope/drag, split pattern, runner/riser, sprue, crucible: **D**

Mark out the correct shape onto MDF. Cut to size and finish to leave smooth edges and draft angle: **E**

Remove scratches and polish: **F**

Vertical milling machine
Cutting tool
Vice: **G**

Place pattern into casting boxes. Compact sand and remove pattern. Pour Aluminium: **H**

Centre punch
Pillar drill
5 mm twist drill
Vice: **I**

Remove any sharp edges created by drilling the holes: **J**

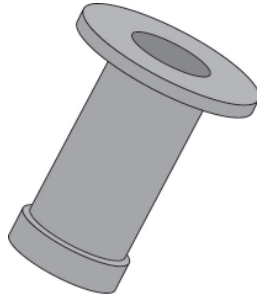
14

Turn over ►



5 **Figure 7** shows a rear axle spacer used on a bicycle.

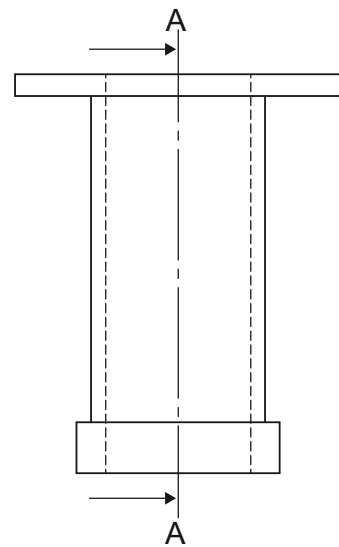
Figure 7



5 (a) Draw a side elevation of the rear axle spacer through Section A - A, as shown in **Figure 8** below.

[3 marks]

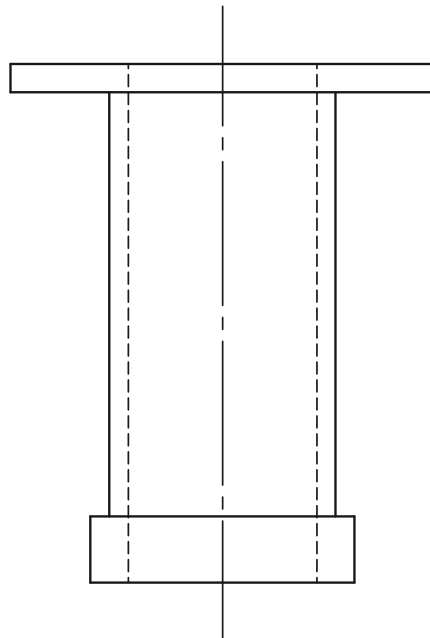
Figure 8



5 (b) Draw the plan view of **Figure 9**.

[4 marks]

Figure 9



7

Turn over ►



6 Metals can be treated in order to change their material properties.

6 (a) Explain why steel is hardened.

[2 marks]

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6 (b) (i) Give **one** disadvantage of hardening steel.

[1 mark]

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6 (b) (ii) Describe the process of case hardening low carbon steel.

[5 marks]

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8



7 Due to advances in modern technology, electrically assisted bicycles have become more popular.
Describe the environmental effects of using electrically assisted bicycles.

[3 marks]

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3

Turn over for the next question

Turn over ▶



8 **Figure 10** shows a rack which allows a bicycle to be transported when travelling by car.

Figure 10



8 (a) A client asks a designer to design a bicycle car rack. Suggest **three** items of information needed before the designer can begin work.

[3 marks]

- 1
- 2
- 3



8 (b) Using the three items of information you have given in part (a), add details below to produce an initial specification for the bicycle car rack.

[6 marks]

Specification Point 1

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Specification Point 2

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Specification Point 3

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9

END OF QUESTIONS



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