

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
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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).



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

**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** .....

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**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 ▶**



1 (b) (iii) Identify a suitable material for handlebar grips.

[1 mark]

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1 (b) (iv) Explain why the material you have chosen for handlebar grips would be suitable.

[2 marks]

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1 (c) Modern bicycle frames are often manufactured from composite materials. Explain the advantages and disadvantages of using composite materials.

Quality of Written Communication will be assessed in your answer.

[6 marks]

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**Section B**

Answer **all** questions from this section.

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

**Figure 3**

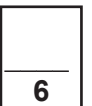


Using notes and sketches in the space below, describe how an electrically powered bicycle could be controlled.

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.

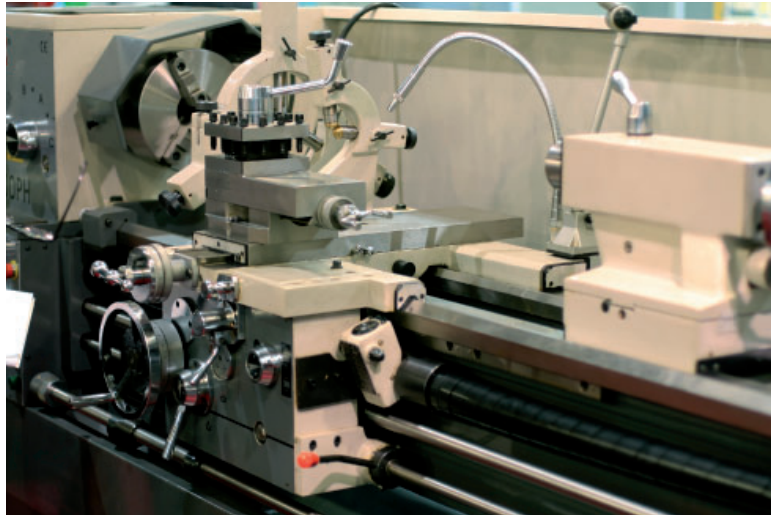
**[4 marks]**

	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 .....

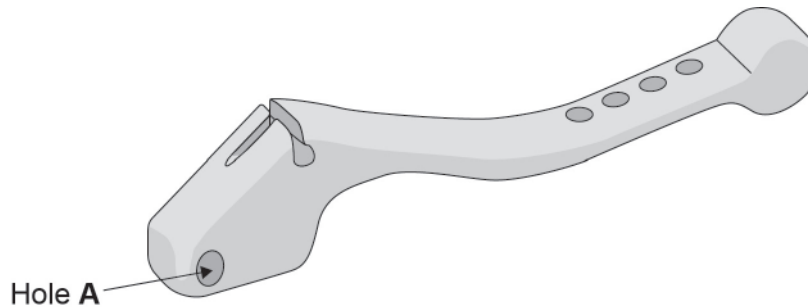
10

Turn over ▶



- 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.

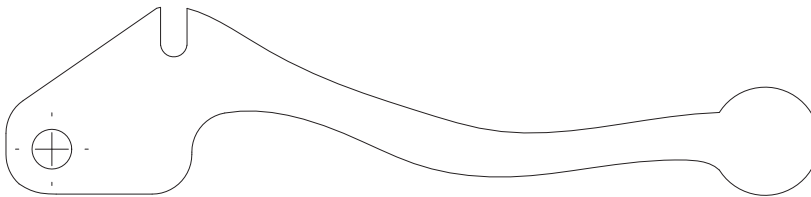
**Figure 5**



- 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**

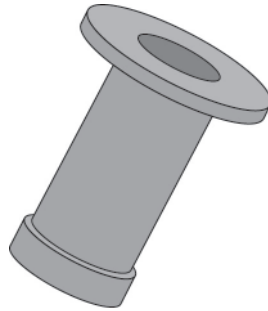
Remove any sharp edges created by  
drilling the holes: **J**

Turn over ▶



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

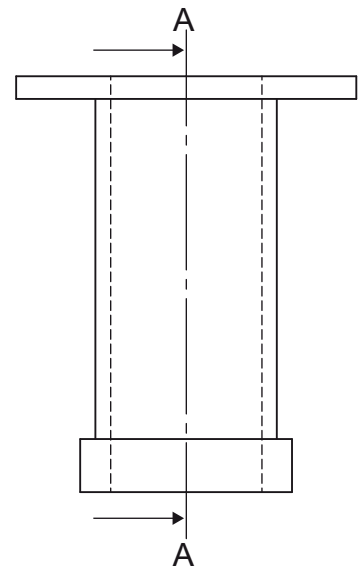
**Figure 7**



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

**[3 marks]**

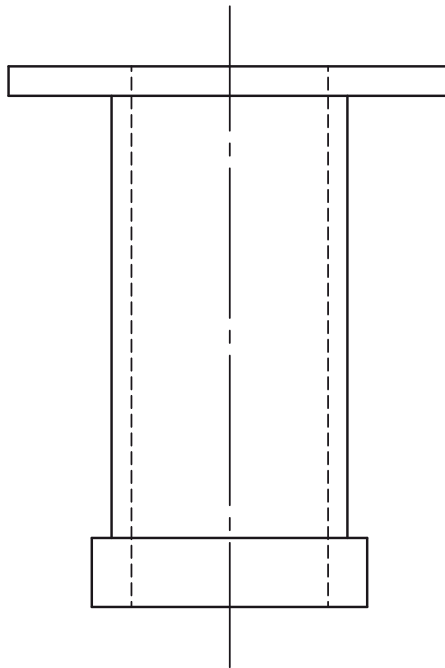
**Figure 8**



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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<b>8</b>



**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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<b>3</b>

**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.....  
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**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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