A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE
ENGINEERING

8852/W

Unit 1 Written Paper

Time allowed: 2 hours

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

J U N 2 1 8 8 5 2 W 0 1

For this paper you must have:
- **normal writing and drawing instruments**
- **a calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen. Use pencil only for drawing.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Some questions will require you to shade a circle. If you make a mistake cross through the incorrect answer.**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**

INFORMATION

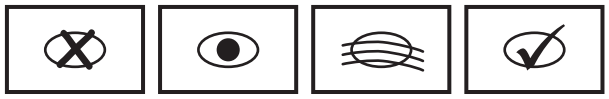
- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 120.**
- **You are reminded of the need for good English and clear presentation in your answers.**

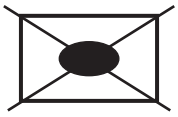
DO NOT TURN OVER UNTIL TOLD TO DO SO

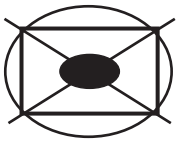
Answer ALL questions in the spaces provided.

For each question completely fill in the circle alongside the appropriate answer.

CORRECT METHOD 

WRONG METHODS 

If you want to change your answer you must cross out your original answer as shown. 

If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown. 

0 1 . 1

The list below shows a range of different metals.

Shade TWO circles to identify the metals that are ferrous.
[2 marks]

- ⬭ **A Aluminium**
- ⬭ **B Bronze**
- ⬭ **C Cast iron**
- ⬭ **D Copper**
- ⬭ **E Lead**
- ⬭ **F Low carbon steel**

[Turn over]

0 1 . 2

Which ONE of the following properties allows a material to absorb impact without breaking? [1 mark]

- ⬭ **A Ductility**
- ⬭ **B Hardness**
- ⬭ **C Plasticity**
- ⬭ **D Toughness**

0 1 . 3

Complete the following statement using the word bank provided.

Ceramic materials have many engineering applications.

They are very good _____ for both

electricity and heat.

However, a disadvantage is _____ .

Ceramic products are usually made by

_____ processes.

WORD BANK

brittleness, conductors, corrosion resistance, insulators, machining, malleability, melting , moulding, tools
[3 marks]

[Turn over]

0 1 . 4

Which category of testing includes a compressive strength test? [1 mark]

⬭ **A Destructive**

⬭ **B Electrical**

⬭ **C Hardness**

⬭ **D Visual**

0 1 . 5

Which force directly opposes the weight of an aeroplane and holds the aeroplane in the air? [1 mark]

⬭ **A Drag**

⬭ **B Friction**

⬭ **C Lift**

⬭ **D Thrust**

[Turn over]

0 1 . 6

Which heat treatment process applied to steel involves cooling at room temperature? [1 mark]

⬭ **A Annealing**

⬭ **B Hardening**

⬭ **C Normalising**

⬭ **D Tempering**

0 1 . 7

Which component reduces current flow in an electronic system? [1 mark]

⬭ **A Capacitor**

⬭ **B Diode**

⬭ **C Resistor**

⬭ **D Transistor**

10

[Turn over]

0 2 . 1

Composite materials have many engineering applications.

Complete TABLE 1 to create a chart showing the properties and applications of composite materials.

Some parts have been completed for you. [3 marks]

TABLE 1

COMPOSITE	PROPERTY	APPLICATION
Glass reinforced polymer		Canoes, boat hulls
Medium Density Fibreboard	Smooth surface, easily machined and painted	
	Reinforced with steel bars for tensile strength	Bridges and buildings

0 2 . 2

Give TWO reasons why a composite material would be chosen over other materials. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

5

[Turn over]

0 3 . 1

Sand-casting is a process used to make metal components.

Identify the FOUR main stages of the sand-casting process. [4 marks]

Stage 1 _____

_____

_____

Stage 2 _____

_____

_____

Stage 3 _____

_____

_____

Stage 4 _____

_____

_____

0 3 . 2

Engineering uses precision casting. An example might be an engine block.

Select ONE casting method other than sand casting that is suitable for manufacturing the engine.

Give reasons for using this production method.
[4 marks]

My chosen method _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

0 3 . 3

An aluminium casting is 550 mm long, 320 mm wide and 350 mm high.

The density of the aluminium is 0.0027 g/mm^3

Use the equation given below to calculate the mass of the casting in kilograms (kg).

Density = mass/volume ($p = m/v$)

Show your working. [4 marks]

_____

_____

_____

_____

Answer _____ kg

12

[Turn over]

0 4 . 1

Give TWO advantages and disadvantages of a THERMOSETTING polymer used to manufacture an electrical socket. [4 marks]

Advantage 1 _____

_____

_____

Advantage 2 _____

_____

_____

Disadvantage 1 _____

_____

_____

Disadvantage 2 _____

_____

_____

0 4 . 2

Name ONE suitable manufacturing process for products made from THERMOPLASTIC polymers.

Describe the process. [3 marks]

Name of process _____

_____

Description _____

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

0 4 . 3

Polycarbonate is a thermoplastic polymer commonly used for safety glasses.

Explain TWO of the properties of polycarbonate that make it a suitable material for this product. [4 marks]

Property 1 _____

_____

_____

_____

_____

_____

Property 2 _____

_____

_____

_____

_____

_____

11

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[Turn over]

0 5 . 1

Explain the difference between a pneumatic system and a hydraulic system. [2 marks]

0 5 . 2

FIGURE 1 shows an automated punch press.

FIGURE 1

Analyse the suitability of a hydraulic system OR a pneumatic system as a method to power the automated punch press.

Select ONE method and give reasons for your choice. [4 marks]

My chosen method _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

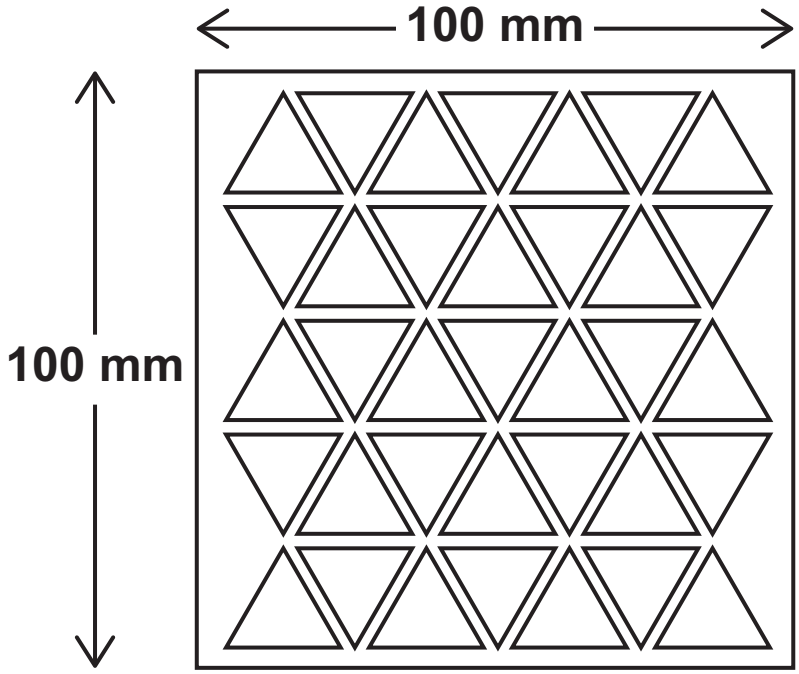
0 5 . 3

The automated punch press could be used to manufacture an aluminium grille.

FIGURE 2 shows the number of triangles that are punched out of the aluminium to make the grille.

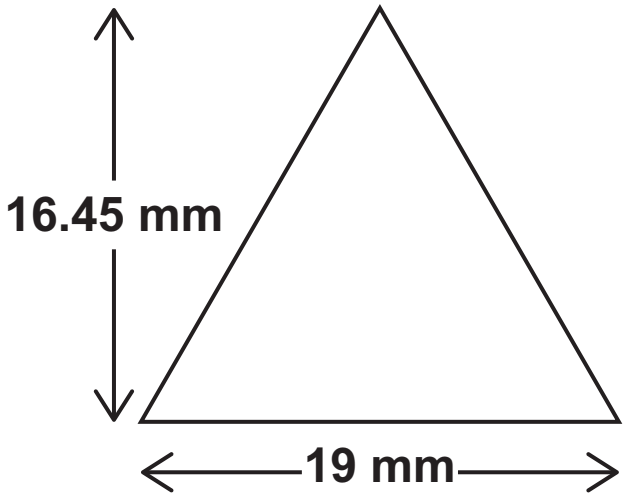
FIGURE 3 shows the sizes of the triangles.

FIGURE 2



Not drawn accurately

FIGURE 3



Not drawn accurately

Calculate the total area of the punched triangles.

Show your working.

Give your answer in mm^2 [3 marks]

Answer _____ mm^2

0 5 . 4

Calculate the amount of aluminium remaining after the triangles have been punched. [2 marks]

Answer _____ mm^2

0 5 . 5

Name ONE suitable surface finishing process that could be applied to the aluminium grille and ONE reason for using it. [2 marks]

Process _____

_____

_____

Reason _____

_____

_____

[Turn over]

0 5 . 6

To make one complete aluminium grille, the manufacturer uses:

- **0.38 m^2 of sheet material**
- **4 rivets**
- **1 surround.**

The cost of materials is shown in TABLE 2.

TABLE 2

ITEM	COST EACH
Sheet material	£3.15 per m^2
Rivets	1.5p
Surround	£1.87

The labour cost of each unit is £2.58

Calculate the cost of each complete grille.

Show your working. [2 marks]

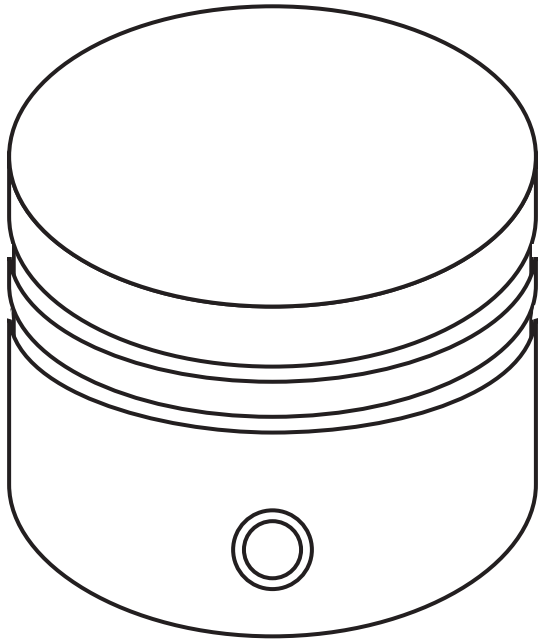
Answer £ _____

[Turn over]

0 5 . 7

FIGURE 4 shows a cylindrical piston which is part of the punch press.

FIGURE 4



The radius of the piston is 30 mm.

The pressure applied is 1.5 N/mm^2

Calculate the force applied to the sheet material.

Use pi (π) = 3.142

Show your working. [4 marks]

Formula _____

_____

_____

Answer _____ N

19

[Turn over]

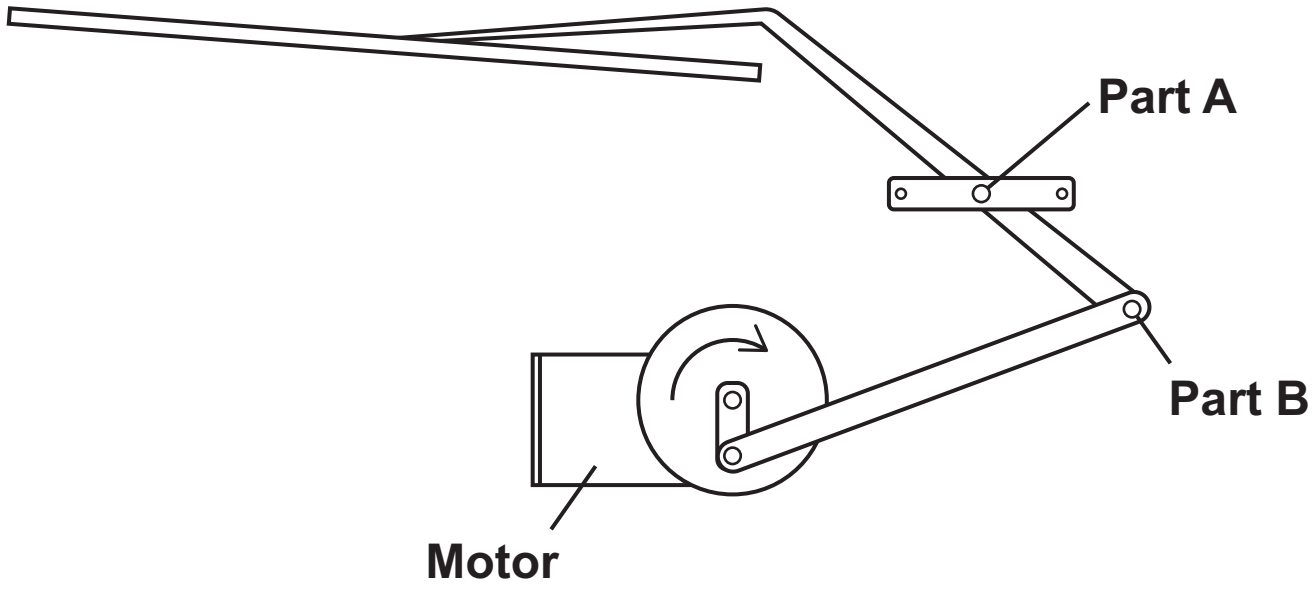
0 6

A windscreen wiper is shown in FIGURE 5.

FIGURE 5

FIGURE 6 shows a diagram of a windscreen wiper mechanism.

FIGURE 6



0 6 . 1

Identify the points at Part A and Part B. [2 marks]

Part A _____

_____

_____

Part B _____

_____

_____

0 6 . 2

The linkage on the windscreen wiper mechanism converts rotary motion to which other type of motion? [1 mark]

_____

_____

[Turn over]

0 6 . 3

FIGURE 7 shows a sliding gate.

FIGURE 7

Name a mechanism that will open and close the sliding gate.

Use notes and sketches to explain how the mechanism operates. [5 marks]

Name of mechanism _____

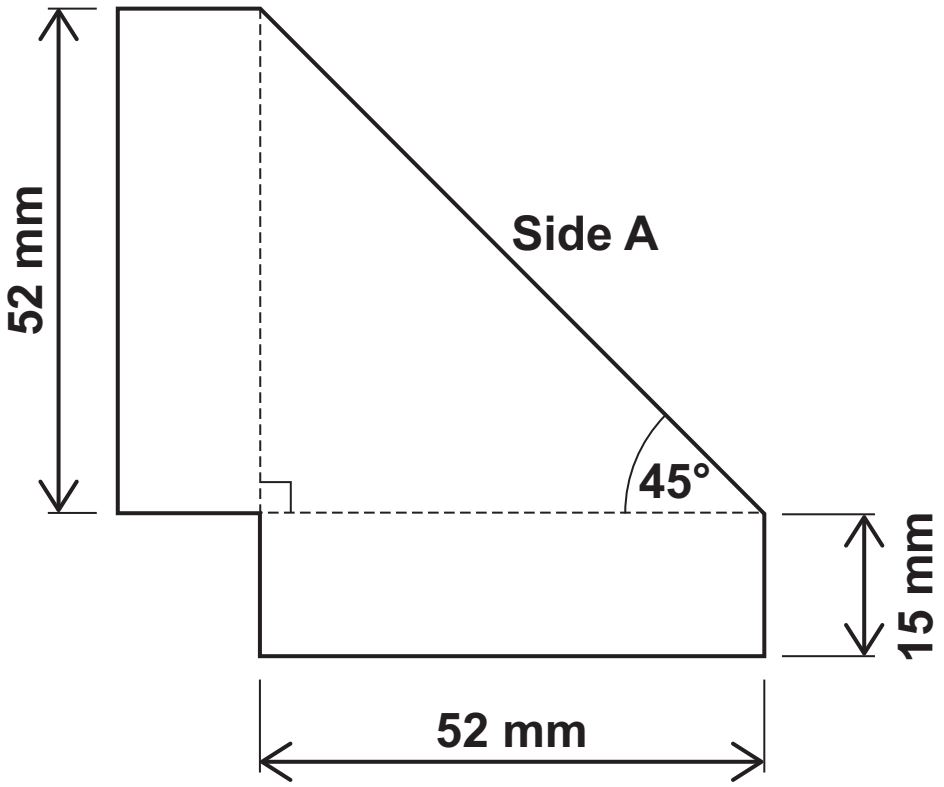
_____

8

0 7 . 1

A corner plate is shown in FIGURE 8.

FIGURE 8



Calculate the total area of the corner plate.

Show your working. [2 marks]

Answer _____ mm^2

0 7 . 2

Calculate the length of Side A shown in FIGURE 8.

Show your working. [3 marks]

Answer _____ mm

5

0 8

Chemical etching is a process used to manufacture Printed Circuit Boards (PCBs).

Evaluate the risks of using this process. [4 marks]

4

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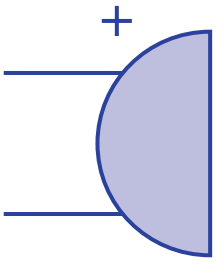
[Turn over]

0 9 . 1

FIGURE 9 shows a circuit symbol for a buzzer.

FIGURE 9



What type of device is a buzzer? [1 mark]

0 9 . 2

Calculate the value of the resistor needed if the maximum current draw for a lamp is 20 mA and the voltage is 6 V.

Give the units with your answer. [3 marks]

Formula used _____

_____

_____

_____

_____

_____

_____

_____

_____

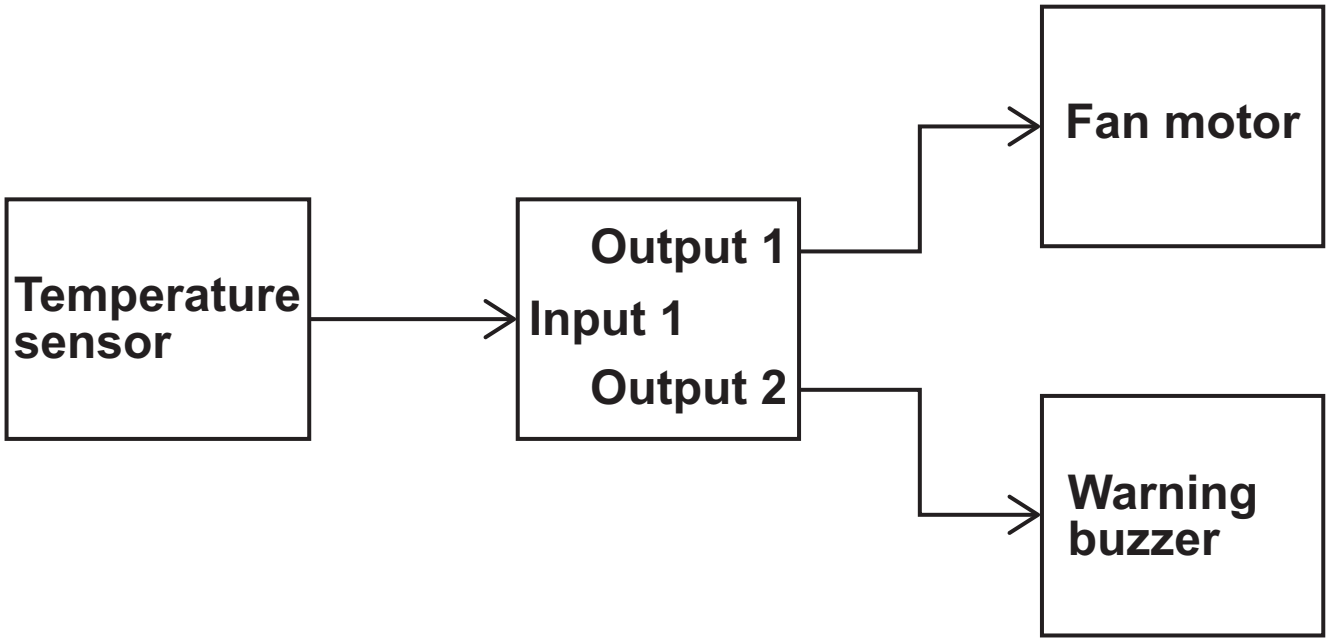
Answer _____

[Turn over]

0 9 . 3

FIGURE 10 is a block diagram of a cooling system that monitors the temperature of a device.

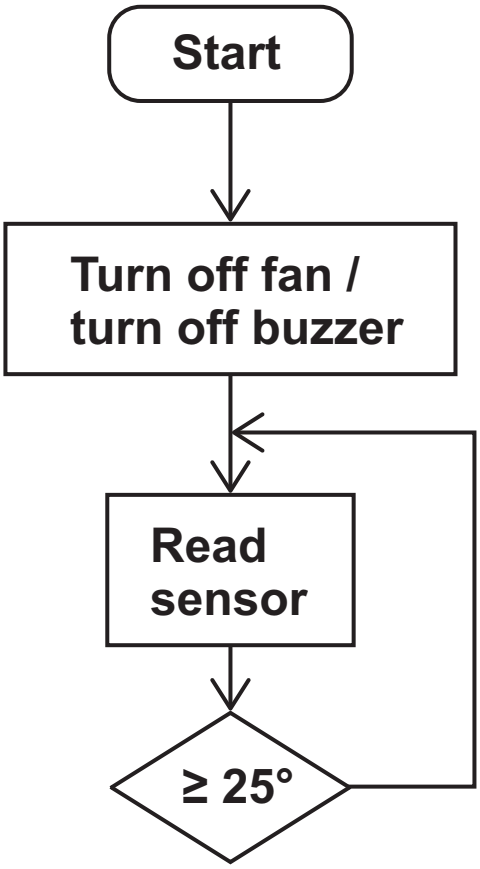
FIGURE 10

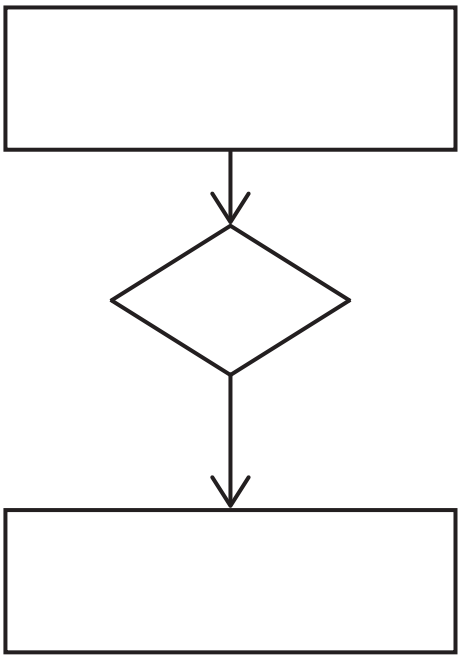


Complete the flow chart on PAGE 43 so that the system works in the following way:

- **output 1 (Fan motor) switches on when the temperature reaches 25° C**
- **output 2 (Warning buzzer) switches on for thirty seconds when the temperature of the system reaches 30° C**
- **the program is always running.**

Some parts of the program have been completed for you. [6 marks]





[Turn over]

0 9 . 4

The flowchart uses the symbol ≥

What is the meaning of this symbol? [1 mark]

_____

_____

0 9 . 5

Give TWO reasons why a program might need to be modified. [2 marks]

Reason 1 _____

_____

_____

Reason 2 _____

_____

_____

13

1 0 . 1

Discuss the advantages and disadvantages of engineered lifespans for the manufacturer and consumer. Include at least ONE example in your answer. [8 marks]

1 0 . 2

Bicycle chains need to be maintained at regular intervals.

Give TWO examples of how a bicycle chain would be maintained. [2 marks]

Example 1 _____

Example 2 _____

1 0 . 3

Explain why it is important to regularly maintain components like a bicycle chain. [2 marks]

_____

_____

_____

_____

_____

_____

[Turn over]

1 0 . 4

Statistical data is used to know how frequently components like bicycle chains need to be replaced.

TABLE 3

BICYCLE NUMBER	KILOMETRES AT FAILURE
1	2200
2	3500
3	3700
4	2900
5	3100
6	2800
7	3200
8	3800

Use TABLE 3 to calculate the mean distance at failure.

Show your working. [2 marks]

Answer _____

10.5 Give TWO factors that would make you change the bicycle chain. [2 marks]

Factor 1 _____

Factor 2 _____

16

[Turn over]

1 1 . 1

Quality control is an essential part of producing engineered products.

Give ONE example of a quality control check that could be applied after the manufacturing process. [1 mark]

1 1 . 2

Explain why it is necessary to work to size tolerances when manufacturing products. [2 marks]

BLANK PAGE

[Turn over]

1 1 . 3

Identify the tools in FIGURE 11 and explain how to use ONE of them. [4 marks]

FIGURE 11

TOOL 1

TOOL 2

Tool 1 _____

_____

Tool 2 _____

_____

My chosen tool is _____

How it is used _____

_____

_____

_____

_____

7

[Turn over]

1 2 . 1

Biomass is one method of energy production.

Name ONE OTHER method of renewable energy production and ONE non-renewable method. [2 marks]

Renewable _____

_____

_____

Non-renewable _____

_____

_____

1 2 . 2

Compare and evaluate the use of biomass with other energy production methods. [8 marks]

_____

_____

_____

_____

_____

_____

10

END OF QUESTIONS

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Additional page, if required.
Write the question numbers in the left-hand margin.

Additional page, if required.
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For Examiner's Use	
Question	Mark
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12	
TOTAL	