A

AQA

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Candidate Number _____

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I declare this is my own work.

GCSE

ENGINEERING

Unit 1 Written Paper

8852/W

Tuesday 20 June 2023 **Morning**

Time allowed: 2 hours

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]

MATERIALS

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.**

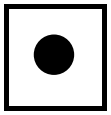
INFORMATION

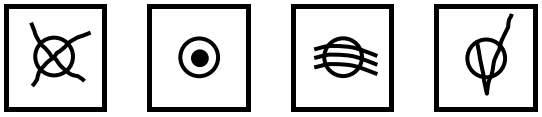
- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 120.**
- **You are reminded of the need for good English and clear presentation in your answers.**

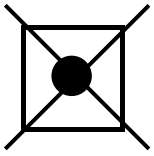
DO NOT TURN OVER UNTIL TOLD TO DO SO

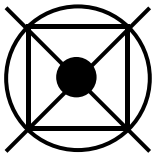
Answer ALL questions in the spaces provided.

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

Which ONE of the following properties allows a material to resist wear and abrasion? [1 mark]

○ **A Ductility**

○ **B Hardness**

○ **C Malleability**

○ **D Toughness**

[Turn over]

0 1 . 2

Which ONE of the following metals is an alloy?
[1 mark]

- ○ **A Brass**
- ○ **B Copper**
- ○ **C Iron**
- ○ **D Zinc**

0 1 . 3

Which of the stock forms listed below does NOT apply to metal? [1 mark]

- ○ **A Bar**
- ○ **B Board**
- ○ **C Rod**
- ○ **D Sheet**

0 1 . 4

Which one of the following properties could be used to describe Lead? [1 mark]

○ **A Brittle**

○ **B Highly conductive**

○ **C Malleable**

○ **D Tough**

[Turn over]

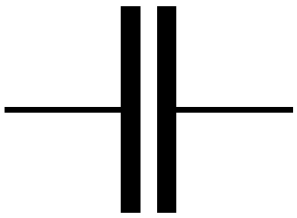
0 1 . 5

What type of electronic device is a comparator?
[1 mark]

- ○ **A Input**
- ○ **B Output**
- ○ **C Process**
- ○ **D Programmable**

0 1 . 6

Name the circuit symbol shown below. [1 mark]



○ **A Battery**

○ **B Capacitor**

○ **C Diode**

○ **D Switch**

[Turn over]

0 1 . 7

Fibre reinforced polymer (FRP) is an example of which type of material? [1 mark]

- ○ **A Alloy**
- ○ **B Composite**
- ○ **C Textile**
- ○ **D Timber**

0 1 . 8

Use the word bank provided, on the opposite page, to complete the following statements. [3 marks]

There are two types of polymers, thermoplastics and

_____ polymers.

When thermoplastics are heated, they become soft and

_____ , allowing them to be

formed into a range of products.

Thermoplastic products can be easily

_____ at the end of their lifecycle.

WORD BANK

- **burnt**
- **disposed of**
- **flexible**
- **hard**
- **recycled**
- **shaped**
- **thermoforming**
- **thermosetting**

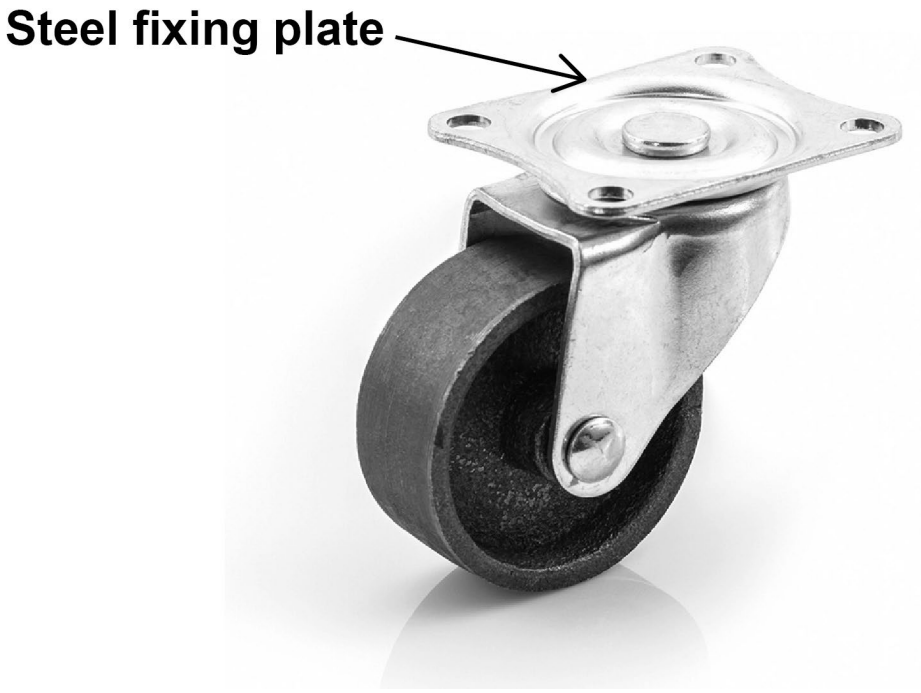
[Turn over]

10

0 2 . 1

FIGURE 1 shows a castor wheel with a steel fixing plate.

FIGURE 1



The fixing plate has been press formed. Using notes and sketches, describe the press forming process in the space, on the opposite page. [6 marks]

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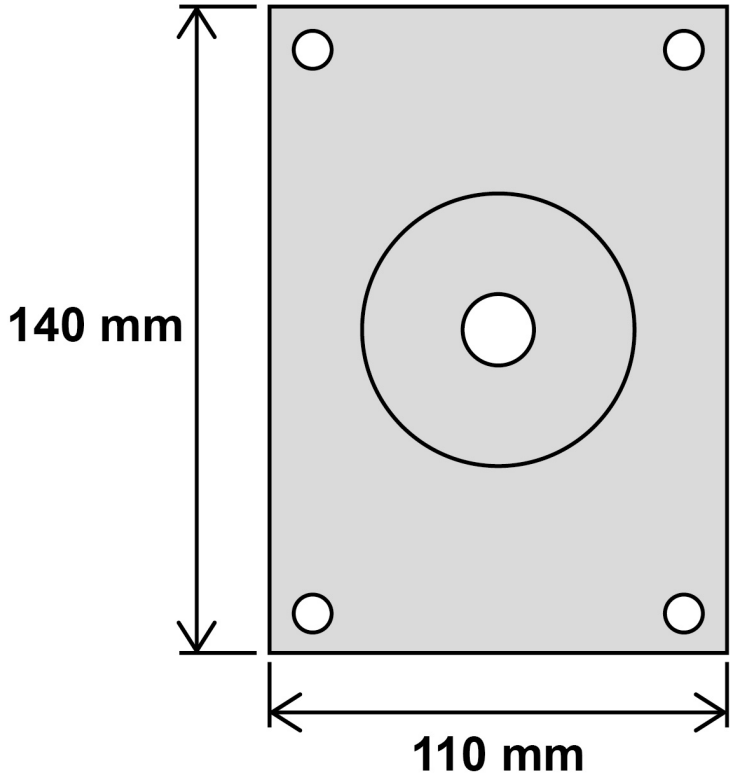
[Turn over]

0 2 . 2

FIGURE 2 shows a drawing of the steel fixing plate.

FIGURE 2



Work out the maximum number of whole fixing plates that could be made from a sheet of steel measuring 0.5 m × 0.5 m.

Show your working. [4 marks]

Answer _____

[Turn over]

0 2 . 3

In a pneumatic press forming system, the output cylinder has a radius of 32 mm.

Calculate the air pressure necessary for the cylinder to deliver a force of 15 605 newtons.

Use the equation P = F/A

Show your working. [4 marks]

Answer _____ **N/m^2**

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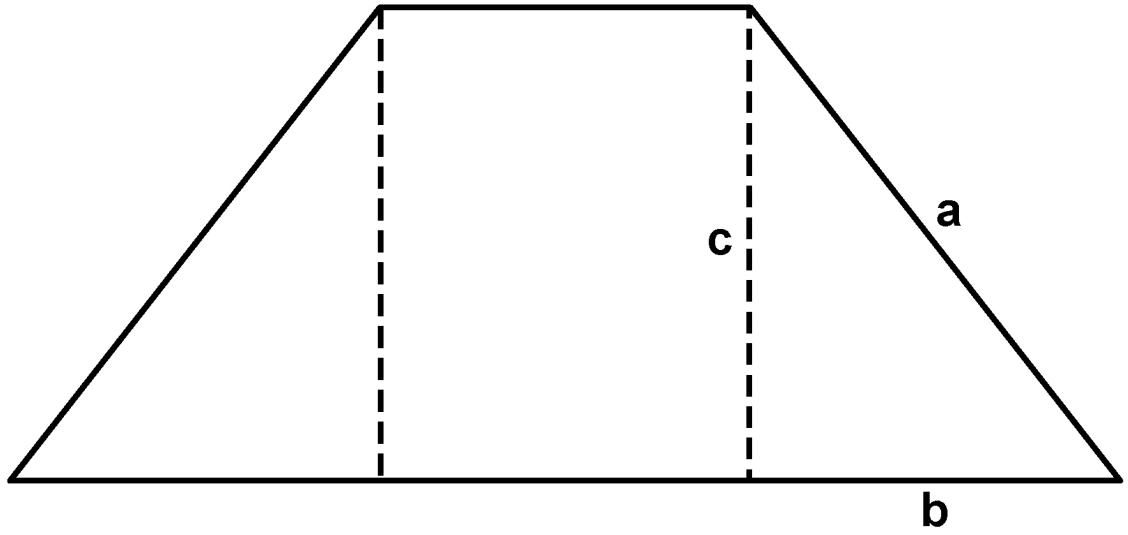
[Turn over]

0 2 . 4

FIGURE 3 shows a castor wheel housing as a development (net).

FIGURE 3



Calculate the length of the side shown at a.

b = 135 mm
c = 156 mm

Use the formula $a^2 = b^2 + c^2$
[4 marks]

Answer a = _____ mm

[Turn over]

0 2 . 5

The manufacturer has decided that the castor wheel housing needs to have a surface finish applied. The manufacturer can choose painting or dip coating.

Evaluate the advantages and disadvantages of each method. [8 marks]

[Turn over]

0 2 . 6

Name ONE suitable finish for the castor wheel housing other than painting or dip coating. [1 mark]

_____

_____

_____

27

0 3 . 1

Name ONE renewable form of energy production. [1 mark]

_____

_____

_____

0 3 . 2

Nuclear energy and fossil fuels are two methods of non-renewable energy production.

Compare the two energy production methods. Discuss the following aspects in your answer:

- **advantages and disadvantages**
- **impact on the environment.**

[8 marks]

BLANK PAGE

[Turn over]

0 4 . 1

FIGURE 4 shows a corner bracket manufactured from low carbon steel.

FIGURE 4

One bracket will be made in a school workshop.

Complete the production plan, on the opposite page, by giving the names of tools or equipment to be used for each stage. [5 marks]

STAGE	TOOL/EQUIPMENT
Mark out the size and the position of the holes	
Cut the metal to size	
Finish the cut edges	
Make the holes	
Bend the metal shape to 90 degrees	

[Turn over]

0 4 . 2

Describe the difference between brazing and welding.
[2 marks]

0 4 . 3

FIGURE 5 shows cylindrical aluminium components.

FIGURE 5

Name ONE process that can be used to produce these aluminium components. [1 mark]

0 5 . 1

A new engineering company is setting up in a local community.

Discuss the advantages and disadvantages of the engineering company for the local community.

Include in your answer:

- **impact on society**
- **impact on the local economy.**

[6 marks]

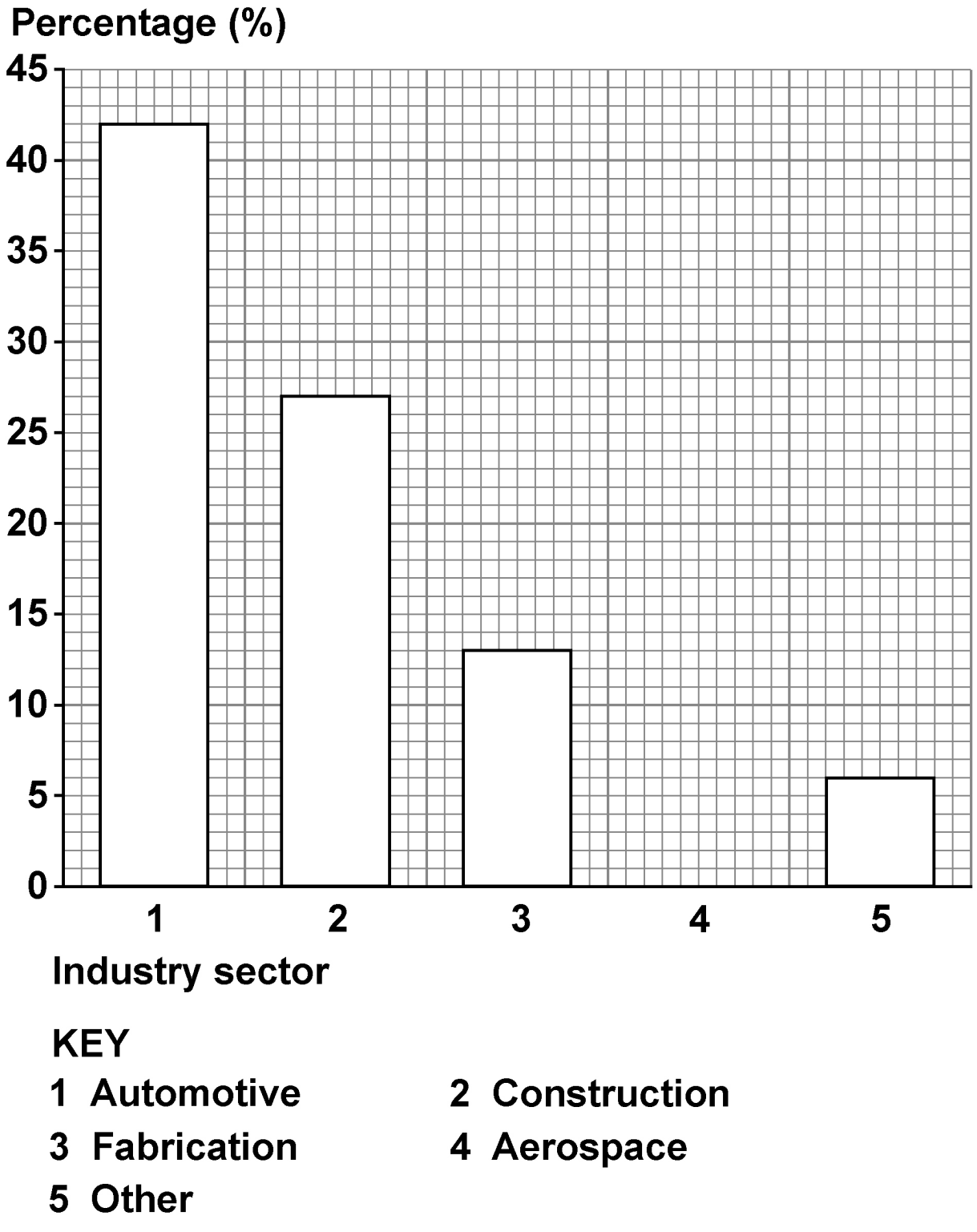
[Turn over]

BLANK PAGE

[Turn over]

The engineering company has collected data on industry sectors that buy their products. FIGURE 6 shows an incomplete bar chart with the results.

FIGURE 6



0 5 . 2

Aerospace is missing from the bar chart.

Calculate the percentage for the Aerospace industry.

Show your working. [2 marks]

Aerospace industry % = _____

0 5 . 3

Complete the graph, on the opposite page, by adding the Aerospace bar. [1 mark]

[Turn over]

0 5 . 4

The total value of all sales is £18 million.

Calculate the value of Construction industry sales.

Show your working. [2 marks]

Answer £ _____

11

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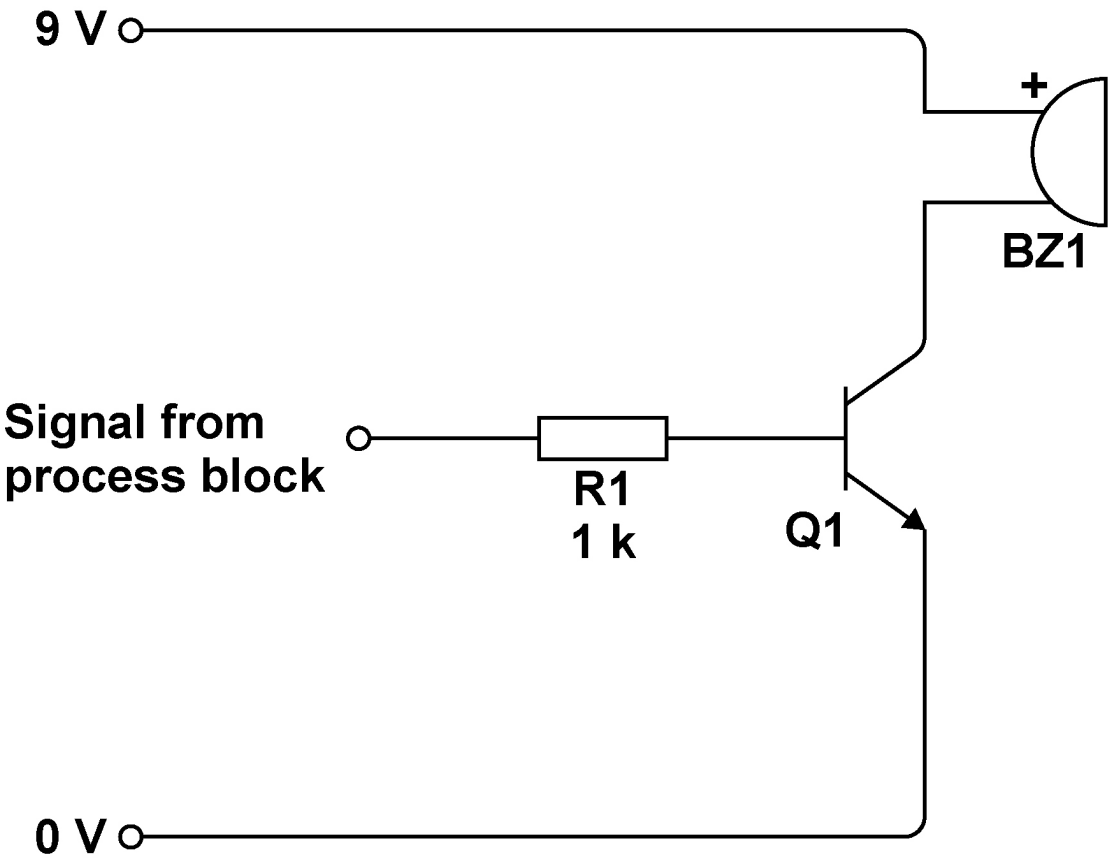
[Turn over]

0 6 . 1

FIGURE 7 shows a simple buzzer circuit.

FIGURE 7



State the function of the transistor within the circuit.
[1 mark]

0 6 . 2

Name ONE audible output device that could be used instead of the buzzer. [1 mark]

_____

_____

_____

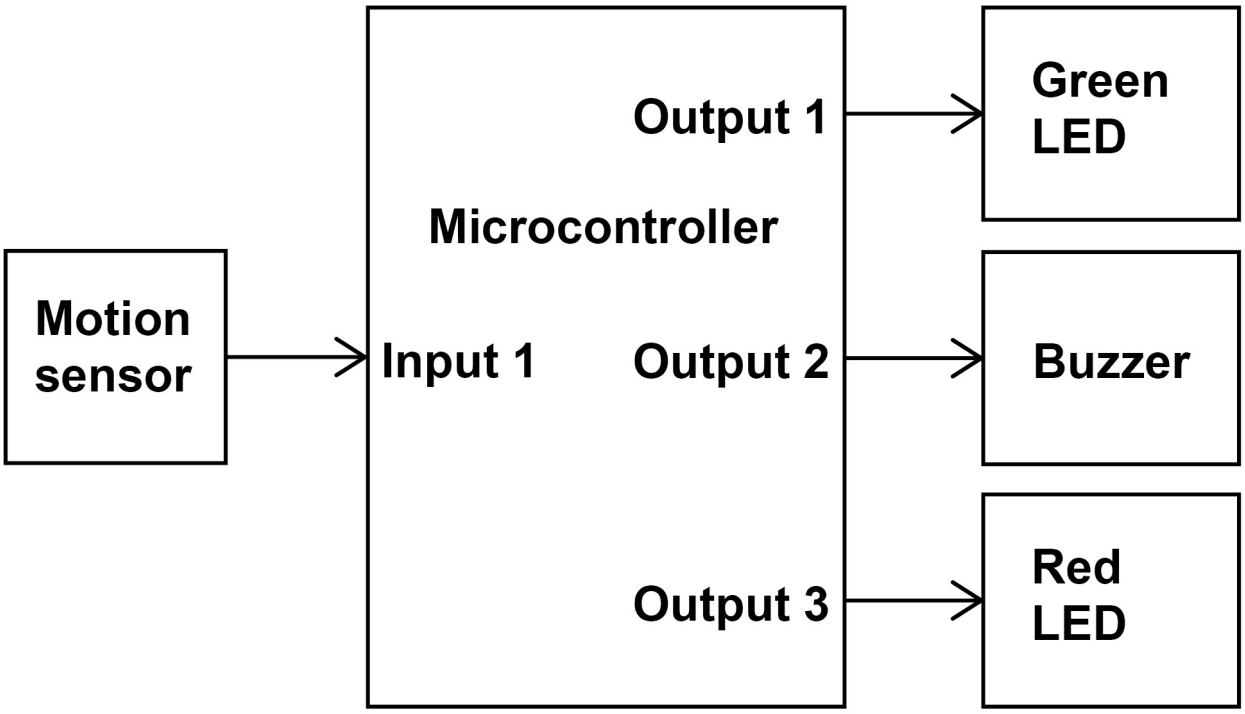
_____

[Turn over]

0 6 . 3

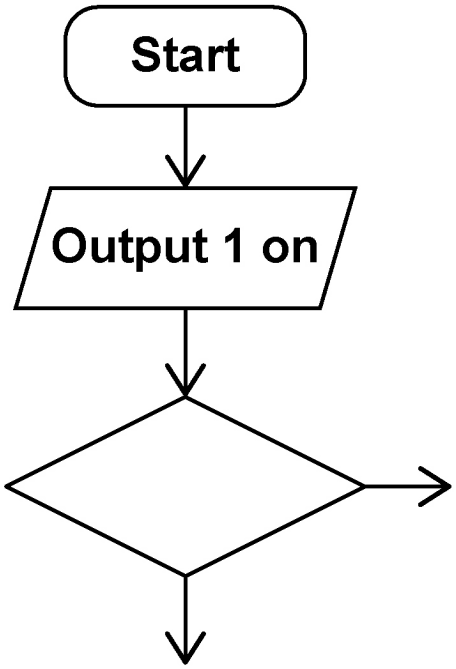
The buzzer will be used in an alarm system. FIGURE 8 shows the system diagram for the alarm system.

FIGURE 8



- **Output 1, the green LED is on.**
- **When the motion sensor is activated, the green LED goes off, a red LED comes on for 30 seconds and the buzzer sounds for 30 seconds.**
- **The red LED turns off, the green LED turns back on and the buzzer stops.**
- **The system works whenever the motion sensor is activated.**

Complete the flowchart in the space, on the opposite page, so that the system works as stated. [6 marks]


Start
Output 1 on

0 6 . 4

Give TWO advantages of writing an electronic program as a flowchart. [2 marks]

Advantage 1 _____

_____

_____

Advantage 2 _____

_____

_____

0 6 . 5

Explain the difference between an AC and DC power supply. Use notes and/or sketches in your answer. [2 marks]

0 6 . 6

Name TWO advantages of using batteries as a power supply rather than mains electricity. [2 marks]

Advantage 1 _____

_____

_____

Advantage 2 _____

_____

_____

0 6 . 7

Name ONE type of logic gate. [1 mark]

_____

_____

_____

0 6 . 8

Give the function of the logic gate you have named.
[1 mark]

_____

_____

_____

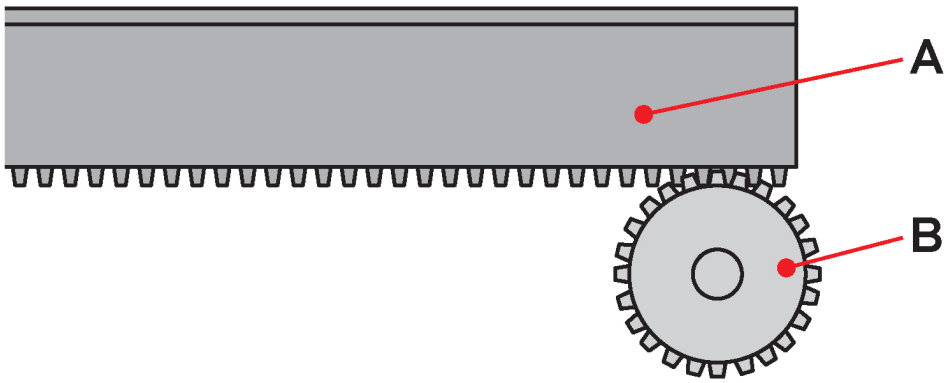
[Turn over]

16

0 7 . 1

FIGURE 9 shows a rack and pinion mechanism.

FIGURE 9



Complete the sentences below. [2 marks]

The motion at point A is _____ .

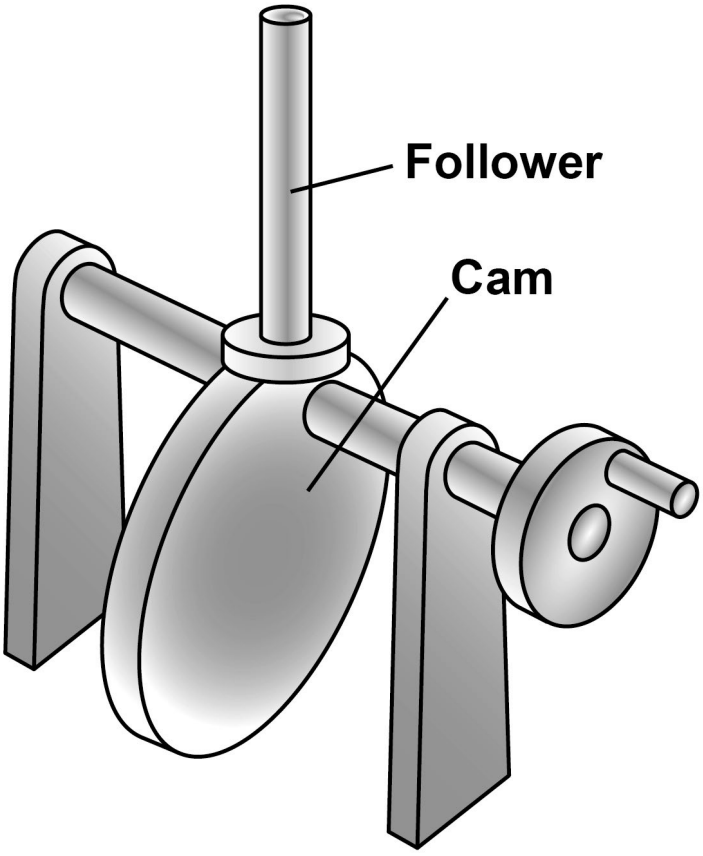
This is converted to _____

motion at point B.

0 7 . 2

FIGURE 10, on the opposite page, shows a simple cam and follower mechanism.

FIGURE 10



Explain the function of the follower. [2 marks]

0 7 . 3

Give TWO reasons why machinery needs to be regularly maintained. [2 marks]

Reason 1 _____

_____

_____

Reason 2 _____

_____

_____

0 7 . 4

Discuss TWO reasons why moving parts in machinery need to be lubricated. [4 marks]

Reason 1 _____

_____

_____

_____

_____

_____

Reason 2 _____

_____

_____

_____

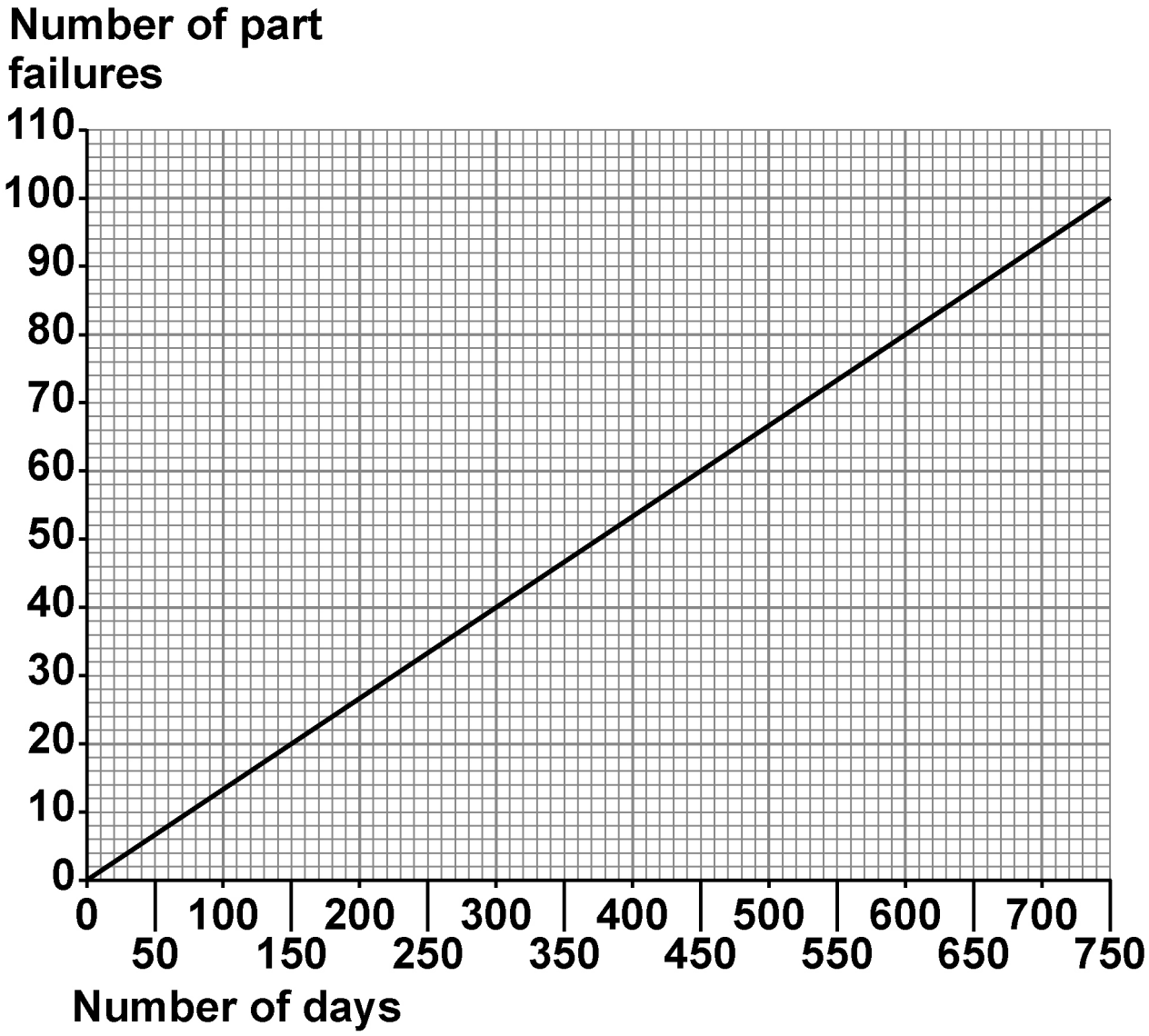
_____

_____

[Turn over]

FIGURE 11 shows data the engineering company have collected on how long a machine part lasts before failing.

FIGURE 11



0 7 . 5

Calculate the slope of the graph at 300 days.

Show your working. [2 marks]

0 7 . 6

A mechanical component is shown in FIGURE 12.

FIGURE 12

Name the component. [1 mark]

0 7 . 7

State the function of the component. [1 mark]

14

0 8 . 1

A length of metal wire is 300 mm long. When a load is suspended from the wire, it stretches by 2.5 mm.

Calculate the strain in the wire. [3 marks]

[Turn over]

0 8 . 2

When a stress of 2.2 N/mm^2 is applied to the metal wire, the strain produced is 0.019

Calculate the Young's modulus of the wire material.

Use the formula Young's modulus E = Stress/strain or $E = \sigma/\varepsilon$

Give your answer to one decimal place. [2 marks]

Answer _____ **N/mm^2**

0 8 . 3

Name the type of strength the cable in a pulley system must have. [1 mark]

0 8 . 4

Describe how the strength of the pulley cable could be tested. [2 marks]

[Turn over]

0 8 . 5

State the TWO main functions of a pulley system.
[2 marks]

Function 1 _____

_____

_____

Function 2 _____

_____

_____

10

0 9 . 1

Components can be manufactured using rapid prototyping (3D Printing) methods.

Analyse the advantages and disadvantages of using this method to manufacture components. [8 marks]

0 9 . 2

Give TWO examples of how quality control methods could be applied to manufactured components.
[4 marks]

Method 1 _____

Used for _____

_____

_____

Method 2 _____

Used for _____

_____

_____

[Turn over]

0 9 . 3

A component has a length of 150 mm. The length must be manufactured with a tolerance of ±2%.

Calculate the maximum and minimum acceptable lengths.

Show your working. [3 marks]

Minimum _____ **mm**

Maximum _____ **mm**

END OF QUESTIONS

15

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
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9	
TOTAL	

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