



Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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I declare this is my own work.

GCSE ENGINEERING

Unit 1 Written Paper

Monday 2 June 2025

Afternoon

Time allowed: 2 hours

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.
- 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.
- 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



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

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 is a ferrous material?

[1 mark]

A Aluminium

☐

B Brass

☐

C Cast iron

☐

D Zinc

☐

0 1 . 2 Which **one** of the following statements describes quenching?

[1 mark]

A Allowing steel to cool naturally

☐

B Coating steel with a protective layer

☐

C Cooling steel rapidly in water

☐

D Keeping steel at a specific temperature

☐


0 1 . 3 What is the name of the process used to enlarge a hole when using a lathe?

[1 mark]

- A** Boring ☐
- B** Facing off ☐
- C** Parting off ☐
- D** Sawing ☐

0 1 . 4 Which **one** of the following is a common property of ceramics?

[1 mark]

- A** Brittleness ☐
- B** High ductility ☐
- C** Low melting point ☐
- D** Malleability ☐

0 1 . 5 Which **one** of the following is an input device?

[1 mark]

- A** LED ☐
- B** Light sensor ☐
- C** Piezo sounder ☐
- D** Solenoid ☐

0 1 . 6 Which **one** of the following is the formula for Young's modulus?

[1 mark]

- A** Change in length/original length ☐
- B** Original length/change in length ☐
- C** Strain/stress ☐
- D** Stress/strain ☐

Turn over ►



0 1 . 7

Which **one** of the following is the component shown in **Figure 1**?

[1 mark]

Figure 1**A** Buzzer☐**B** Capacitor☐**C** Resistor☐**D** Switch☐

0 1 . 8

Which **one** of the following properties allows a material to withstand impact?

[1 mark]

A Conductivity☐**B** Hardness☐**C** Malleability☐**D** Toughness☐

0 1 . 9

Which **one** of the following is a thermoplastic?

[1 mark]

A Epoxy

☐

B Melamine resin

☐

C Polystyrene

☐

D Polyurethane

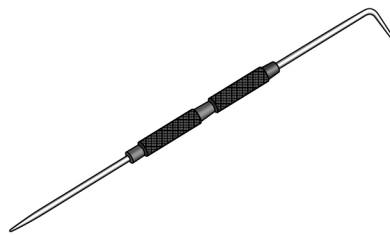
☐

0 1 . 1 0

Figure 2 shows an engineering tool.

What is this tool used for?

[1 mark]

Figure 2

A Bending

☐

B Forming

☐

C Marking

☐

D Shaping

☐

10

Turn over for the next question**Turn over ►**

0	2	.	1
---	---	---	---

Analyse **two** reasons for using riveting rather than welding when joining parts together.

[4 marks]

Reason 1 _____

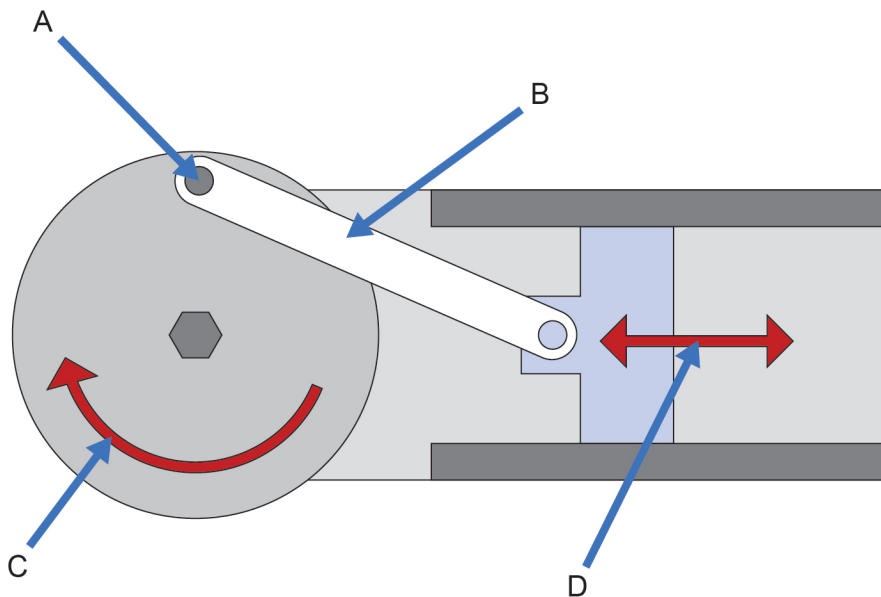
Reason 2 _____



0 2 . 2

Figure 3 shows a commonly used mechanical system.

Figure 3

Name the parts **A** and **B**.

[2 marks]

Part **A** is a _____Part **B** is a _____Name the motions shown at **C** and **D**.

[2 marks]

C shows a _____ motion**D** shows a _____ motion

0 2 . 3

Vulcanised rubber is a thermosetting plastic that is used for car tyres.

State **two** reasons why vulcanised rubber is used for car tyres.

[2 marks]

Reason 1 _____

Reason 2 _____

Turn over ►



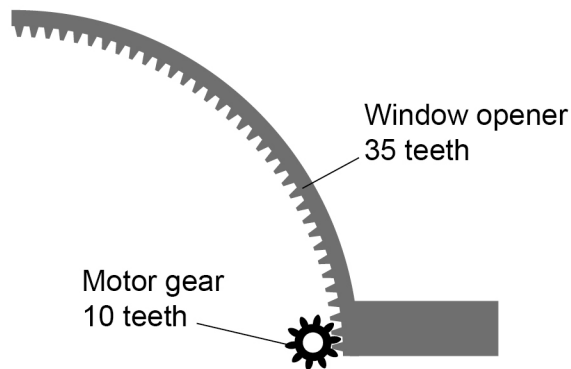
0 2 . 4 State what is meant by the term 'stiffness'.

[1 mark]

0 2 . 5 A window is opened using a rack and pinion system as shown in **Figure 4**.

The motor gear takes 5 seconds to complete 1 full rotation.

Figure 4



Calculate in seconds how long the motor gear needs to rotate to fully open the window.

Use the formula: Rotations = Teeth Driven/Teeth Driver

Show your workings.

[4 marks]

Total time _____ seconds



0 2 . 6

Explain **two** reasons why batteries are used in hand held devices.**[4 marks]**

Reason 1 _____

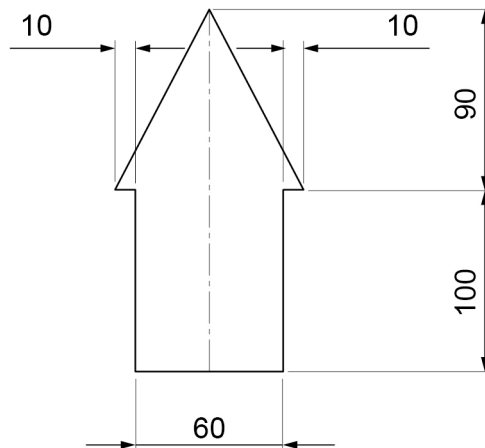
Reason 2 _____

19

Turn over for the next question**Turn over ►**

0 3

A company makes metal plates for a machine as shown in **Figure 5** below.

Figure 5

All dimensions in
millimetres

0 3 . 1

Calculate the area of the metal plate.

Show your working.

[4 marks]

Area _____ mm²



0	3	.	2
---	---	---	---

The company has chosen to make the metal plate from aluminium.

Analyse **two** reasons for using aluminium for the metal plate rather than low carbon steel.

[4 marks]

Reason 1 _____

Reason 2 _____

Question 3 continues on the next page

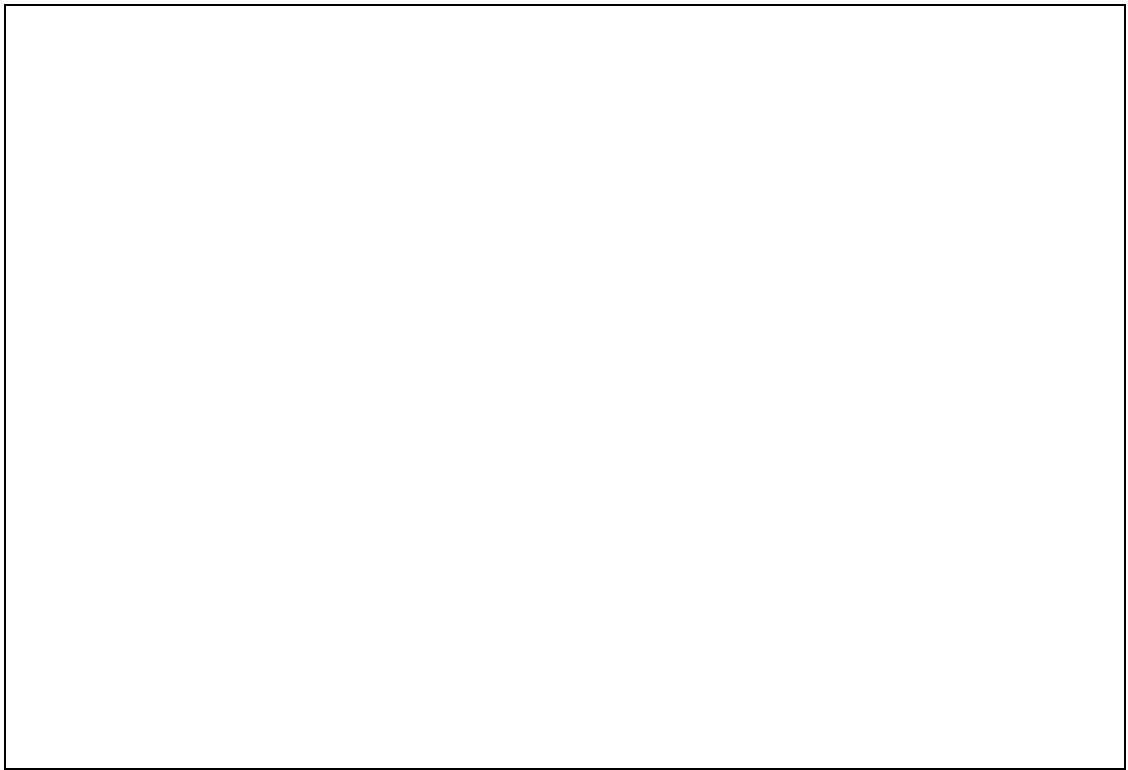
Turn over ►



0 3 . 3

Use notes and/or sketches to explain how to safely polish the aluminium metal plate.

Include information on the equipment/tools to be used.

[6 marks]



0	3	.	4
---	---	---	---

Punching and stamping are both metal manufacturing processes.

Describe **one** difference between punching and stamping.

[2 marks]

16

Turn over for the next question

Turn over ►



0 4 . 1 **Figure 6** shows polymer building bricks.

Figure 6



Analyse why a manufacturer would use injection moulding to mass produce polymer building bricks.

[4 marks]

0	4	.	2
---	---	---	---

A pneumatic system is used to eject the building brick from the injection moulding machine.

Explain why a pneumatic system is used in this situation.

[2 marks]

Question 4 continues on the next page

Turn over ►



A force of 50 N is required to eject the building brick from the injection moulding machine using a circular pin.

Calculate the pressure required in N/mm^2 for the circular pin to eject the building brick.

Use the formula: Pressure (P) = Force (F)/Area (A)

$$\text{Pi } (\pi) = 3.142$$

Give your answer to 2 decimal places.

Show your working.

[5 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.Pressure N/mm^2

11



0 5 . 1Explain **one** difference between an alloy material and a composite material.**[2 marks]**

0 5 . 2

Structural concrete consists of concrete and metal bars.

State the metal commonly used for the metal bars.

[1 mark]

0 5 . 3

Explain why using concrete and metal bars improves the properties of structural concrete.

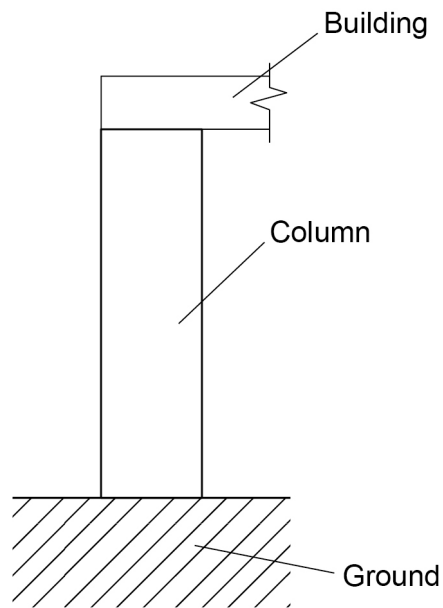
[2 marks]

Question 5 continues on the next page**Turn over ►**

0 5 . 4

Figure 7 shows a column that is used to support a building.

Figure 7



The column has a cross sectional area (csa) of 400 mm^2 .

The maximum stress allowed in the column is 17 N/mm^2 .

Calculate the maximum force the column can support.

Use the formula: $\text{Stress } (\sigma) = \text{Force } (F) / \text{Area } (A)$

Show your working.

[3 marks]

Force _____ N

8



0 6

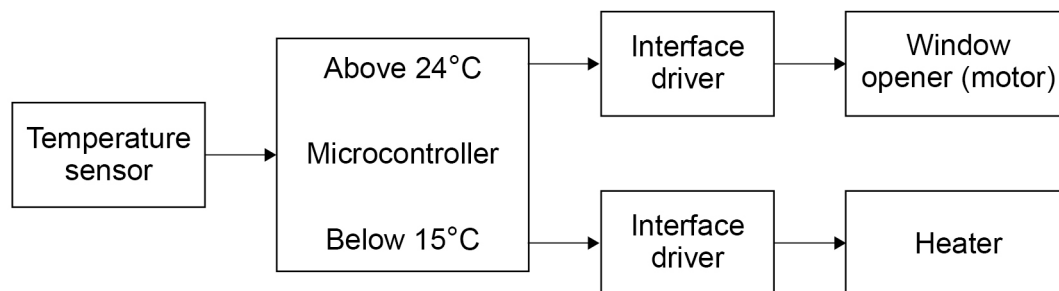
The temperature in a commercial greenhouse needs to be controlled to optimise growing conditions.

If the temperature falls below 15 °C, an electric fan heater is switched on.

If the temperature goes above 24 °C, a window is opened by a motor.

Figure 8 shows the system block diagram.

Figure 8

**0 6****. 1**

Name **one** component that could be used as an interface driver.

[1 mark]

Question 6 continues on the next page

Turn over ►



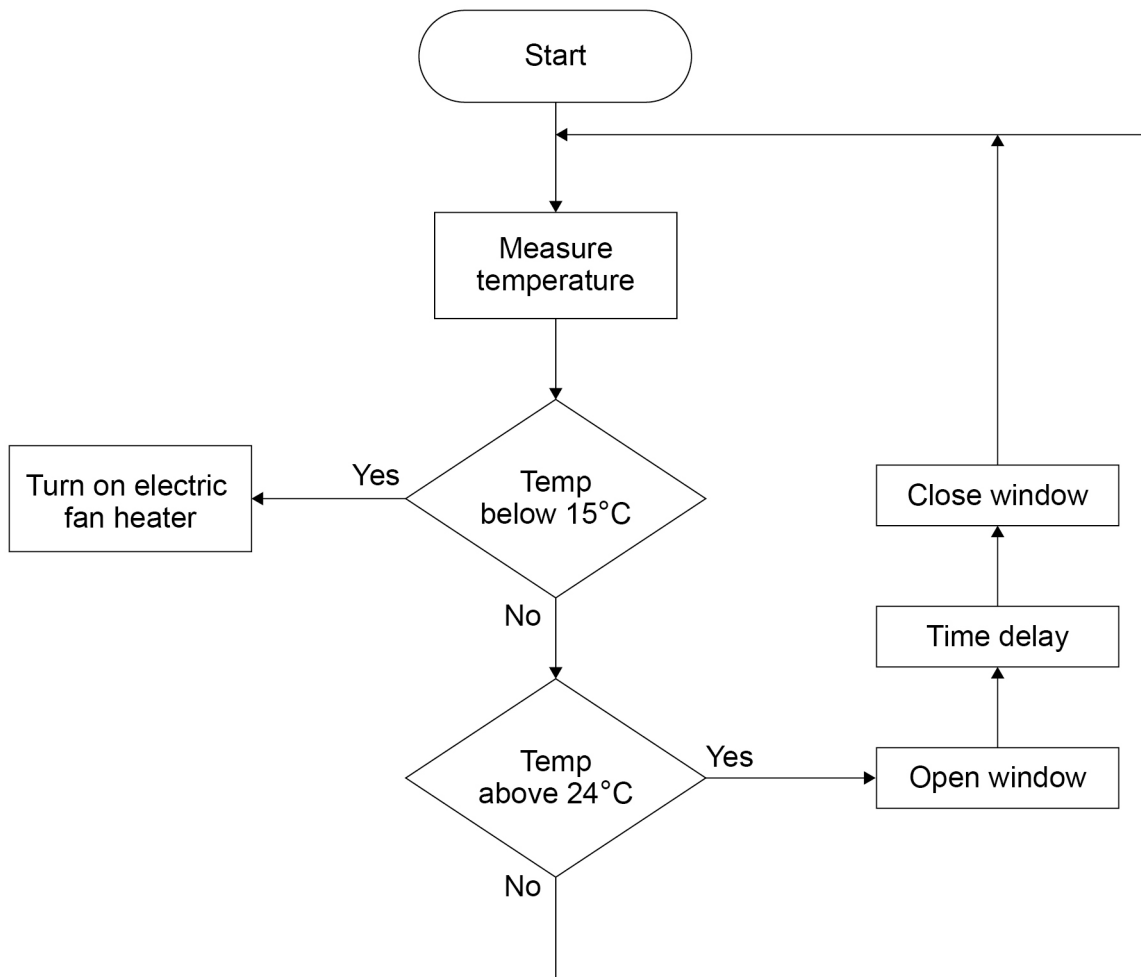
0 6 . 2 Figure 9 shows a simple program to **continuously** control the system.

When tested it is found that it does not function correctly.

Amend the flowchart to correct the errors in the temperature control system.

[4 marks]

Figure 9



0 6 . 3

Use sketches and/or notes to explain how you would conduct a performance test to **reliably measure** the temperature of the air coming from the electric fan heater.

[6 marks]**Turn over ►**

0 6 . 4

State **two other** performance tests the manufacturer could carry out on the electric fan heater.

Explain **one** reason why **each** test is required.

[6 marks]

Test 1 _____

Reason _____

Test 2 _____

Reason _____



The room and air temperatures were recorded from 5 heaters as shown in **Table 1** below.

Heater	1	2	3	4	5
Air Temperature	48	50	51	52	46
Room Temperature	18	18	18	18	20
Change in Temperature	30	32	33	34	26

[1 mark]

Calculate the mean change in temperature for the 5 heaters.

[3 marks]

[illegible]

21

Turn over ►



7

Refer to the following in your answer:

- [8 marks]**

[illegible]

8

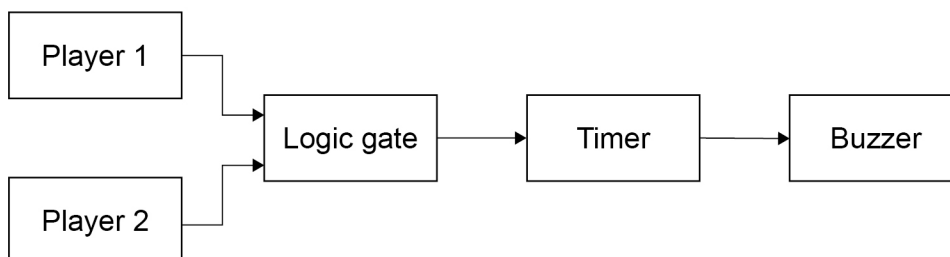


0 8

A manufacturer is going to make an electronic timer for a game.

It will work as shown in the system block diagram in **Figure 10**.

Figure 10

**0 8****1**

The timer starts when **either** player presses their start button.

State the type of logic gate required.

[1 mark]

Question 8 continues on the next page

Turn over ►



0 8 . 2

In the electronic timer, two resistors are connected in series as shown in **Figure 11** below.

Figure 11



The total resistance (R_t) needs to be 140 K Ohm (Ω).

The value of R_2 is 2250 Ohm (Ω).

Calculate the size of the resistor required for R_1 .

Use the formula: Series resistance $R_t = R_1 + R_2$

Show your working.

[4 marks]

R_1 _____ K Ohm (Ω)



0	8	.	3
---	---	---	---

Table 2

Component	Number required	Cost per component
Moulded Case	1	£1.30
Circuit Board	1	75p
Switch	2	21p
Buzzer	1	43p
Screw	4	2p

It takes 20 minutes for a worker to make an electronic timer.

A worker gets paid £12.60 per hour.

Calculate the total cost to manufacture one electronic timer.

[5 marks]

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Total cost £



The manufacturer is considering replacing the switches in the electronic timer with sensors such as light or sound detectors.

In your answer refer to:

- the needs of the manufacturer
- the impact on the manufacturer
- the needs of the user.

[6 marks]

[illegible]

16



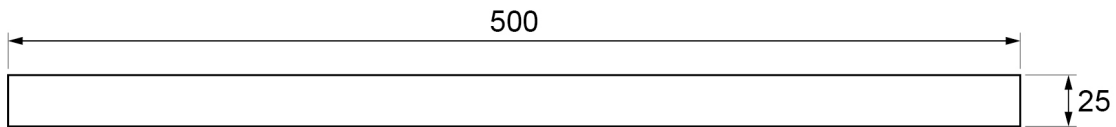
0 9

A manufacturer needs to produce strips from a low carbon steel sheet as shown in **Figure 12** below.

The low carbon steel sheet is 0.5 mm thick.

5 strips are required.

Figure 12



All dimensions in millimetres

0 9 . 1

The manufacturer decides to use a hand cutting process rather than the laser cutting process.

Analyse the benefits of using a hand cutting process in this situation.

[4 marks]

0 9 . 2

The metal strips must be cut with a tolerance of 0.25 mm.

Explain what is meant by tolerance and why it is important.

[2 marks]

Question 9 continues on the next page

Turn over ►



0 9 . 3

Name a tool that would be suitable for measuring the 25 mm dimension to a tolerance of 0.25 mm.

[1 mark]

0 9 . 4

State **two** safety precautions that should be taken when using a laser cutter.

Explain **one** reason for **each** safety precaution.

[4 marks]

Precaution 1 _____

Reason _____

Precaution 2 _____

Reason _____

11

END OF QUESTIONS



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



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