GCSE
ENGINEERING
8852/W

Unit 1 Written Paper

Mark scheme

June 2025

Version: 1.0 Final

256G8852/W/MS

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Glossary for maths

If a student uses a method which is not explicitly covered by the mark scheme the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

[a, b]	Accept values between a and b inclusive.
For π	Accept values in the range [3.14, 3.142]
Their	Accept an answer from the candidate if it has been inaccurately calculated but is subsequently used in a further stage of the question.

Questions which do not ask students to show working

As a general principle, a correct response is awarded full marks.

Qu	Part	Marking Guidance	Total marks	AO
01	1	**C** Cast Iron	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	2	**C** Cooling steel rapidly in water	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	3	**A** Boring	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	4	**A** Brittleness	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	5	**B** Light sensor	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	6	**D** stress/strain	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	7	**A** Buzzer	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	8	**D** Toughness	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	9	**C** Polystyrene	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
01	**10**	**C** Marking	1 mark	AO1a

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>02</td><td>1</td><td>Award up to four marks for analysing reasons why riveting would be used rather than welding when joining parts together.

<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>2</td><td>3–4</td><td>Good understanding shown of more than one benefit of using riveting rather than welding with some reasoning.</td></tr>
<tr><td>1</td><td>1–2</td><td>Basic understanding shown of one benefit of using riveting rather than welding with limited reasoning.

or

benefit(s) with no explanation.</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>

Indicative content

• Riveting can be used to join dissimilar materials but for welding this is difficult/expensive.
• Riveting can be used with a greater range of materials than welding such as composites.
• Riveted joints are easier to disassemble than welded joints.
• Riveting is less energy intensive.
• Riveting is less dangerous than welding.
• Riveting needs less training/not as highly skilled as welding

Accept all other valid responses.</td><td>2 marks

2 marks</td><td>AO1b

AO3a</td></tr>
</table>

Qu	Part	Marking Guidance	Total marks	AO
02	**2**	Award one mark for each point. Part **A** is a Pivot/fulcrum Part **B** is a link/linakage/connecting rod – do **not** accept just rod **C** shows a rotary motion - do **not** accept circular/turning motion **D** shows a reciprocating motion Accept all other valid responses.	2 marks 2 marks	AO1a AO1b

Qu	Part	Marking Guidance	Total marks	AO
02	**3**	Award one mark for each reason. **Indicative content** • Resistant to heat • Elastic • Resistant to abrasion • High tensile strength • Easily moulded but do **not** accept malleable • High friction coefficient • Toughness • Durable Accept all other valid responses. Do **not** accept generic answers such as strong, cheap, strength to weight ratio without justification.	2 marks	AO1b

Qu	Part	Marking Guidance	Total marks	AO
02	**4**	Stiffness is the ability to resist bending Do **not** accept deformation without the reference to bending. Accept all other valid responses.	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
02	**5**	Award up to **four** marks. Allow error carried forward (ECF) if values incorrectly substituted. If correct answer (**17.5 sec**) is given without workings, award full marks. 1 mark for working out how many rotations of the Window opener (Driven) is needed Rotations = Teeth Driven / Teeth Driver Rotation = 35 / 10 **Rotations = 3.5** (1 mark) 1 mark for **understanding total time** is Total time = Rotations × Time/rotation (1 mark) 1 mark for **correct substitution** of values Rotations = 3.5 Time/rotation = 5 sec Total time = 3.5 × 5 (1 mark) 1 mark for **completing calculation** Total time = 17.5 sec (1 mark) **correct answer** **Total time = 17.5 sec or their 17.5 sec**	4 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
02	**6**	Award **one** mark per reason for an identification (up to two marks) and **one** additional mark for each reason (up to two marks). **Indicative content** • Batteries are small / portable – so handheld device can be used anywhere. • Handheld device does not need a cable – so there is a reduced risk of a trip hazard. • Batteries are lower voltage/power – so have a lower risk of electrocution. • Batteries can be sealed inside the device – reducing the risk of leakage during use. • Batteries provide the power – so the device can operate. • Batteries means main power isn't required – so can be used where there is no mains power. • Batteries can be rechargeable – so they can be reused and are therefore more environmentally friendly as they don't end up in land fill. Accept all other valid responses.	2 marks 2 marks	AO1b AO3a

Qu	Part	Marking Guidance	Total marks	AO
03	**1**	Award up to **four** marks. Allow error carried forward (ECF) if values incorrectly substituted. If correct answer (**9600 mm^2**) is given without workings, award full marks. 1 mark for **understanding that total area** is area of **rectangle and** area of **triangle**. Total area = L × W (rectangle) + ½ × B × H (triangle) (1 mark) 1 mark for **calculating base of triangle** Base = W (60) + 2 × 10 Base = 80 mm (1 mark) 1 mark for **correct substitution** of values Total area = L × W + ½ × B × H Total area = 100 × 60 + ½ × 80 × 90 Total area = 6000 + 3600 (1 mark) **Correct answer** **Total area = 9600 mm^2 or their 9600 mm^2** (1 mark)	4 marks	AO2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>03</td><td>2</td><td>
Award up to four marks for analysing reasons for using aluminium for the metal plate rather than low carbon steel.
<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>2</td><td>3–4</td><td>Good understanding shown of more than one reason for using aluminium for the metal plate with some justification.</td></tr>
<tr><td>1</td><td>1–2</td><td>Basic understanding shown of one reason for using aluminium for the metal plate with limited justification.

or

reason(s) with no analysis.</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

• Aluminium has better strength to weight ratio.
• Aluminium is a softer material so will take less force to cut than Low Carbon Steel (LCS).
• Aluminium is lightweight/less dense in comparison to LCS therefore it will add less weight to the machine.
• Aluminium is more corrosion resistant/less likely to rust than LCS therefore no finish required or less maintenance.

Accept all other valid responses.
</td><td>2 marks

2 marks</td><td>AO1b

AO3a</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>03</td><td>3</td><td>Award up to six marks for a correct answer.

<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>3</td><td>5–6</td><td>Good clear notes and/or sketching showing the stages and equipment/tools used. Notes clarify the sketching adding additional information and safety issues.</td></tr>
<tr><td>2</td><td>3–4</td><td>Either sketching and/or notes used which largely show stages and/or equipment/tools but omits some information. Some details about safety and/or stages given/shown but not fully explained</td></tr>
<tr><td>1</td><td>1–2</td><td>Limited sketching and/or notes which do not fully address the question. Makes comments about equipment/tools but lacks detail on how they are used</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>

Indicative content

• Various stages of cleaning surface with increasing grades of emery/wet and dry paper
• Use of fine wet and dry paper both dry and wet.
• Possible use of work holding to make polishing easier/safer
• Use of polishing grit/cream for final stages
• Could include references to PPE (gloves, goggles), polishing machine/mop including the safe use of the machine.

Accept all other valid responses.</td><td>2 marks

4 marks</td><td>AO1a

AO2</td></tr>
</table>

Qu	Part	Marking Guidance	Total marks	AO
03	**4**	Award up to **two** marks for correctly describing **one** difference between punching and stamping. Award **one** mark if only one process is described. **Indicative content** • Punching is where a hole is made in the metal and the surrounding is kept (hole is discarded) whereas stamping is where a component is cut from the metal (surrounding is discarded) • Centre punching can be used to make a single indent/ dot in the metal in lieu of drilling whereas stamping makes an indented shape in the metal. Accept all other valid responses.	2 marks	AO1b

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>04</td><td>1</td><td>Award up to four marks for analysing why a manufacturer would use injection moulding to mass produce polymer building bricks.

<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>2</td><td>3–4</td><td>Good analysis shown of reasons why injection moulding is suitable for mass production.</td></tr>
<tr><td>1</td><td>1–2</td><td>Basic analysis shown of only one reason why injection moulding is suitable for mass production.

or

reason(s) with no analysis.</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>

Indicative content

• Injection moulding has a very low running cost
• Injection moulding can be run as an automated process reducing time/costs with high volume production
• Products are highly repeatable
• Products are made with good tolerance
• Colour of product can be easily changed with little change in process

Accept all other valid responses.</td><td>4 marks</td><td>AO3a</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>04</td><td>2</td><td>Award one mark for an identification and one additional mark for the explanation (2 marks total).

Indicative content

• Fast acting which would reduce ejection time.
• Easy to fit which allows the compressor to be sited remotely to the machine.
• Lower cost when compared to a hydraulic system.
• Cleaner in operation as any leakage is unlikely to cause damage.
• Compressed air is used for other operations such as cooling/ cleaning the mould/door operation.
• Lower pressures are used which therefore makes pneumatic systems safer.

Accept all other valid responses.</td><td>1 mark

1 mark</td><td>AO1a

AO1b</td></tr>
</table>

Qu	Part	Marking Guidance	Total marks	AO
04	**3**	Award up to **five** marks. Allow error carried forward (ECF) if values incorrectly substituted. If correct answer (**1.77 N/mm^2**) is given without workings, award full marks. 1 mark for conversion Diameter = 6 mm Radius = 3 mm (1 mark) 1 mark for **calculating area** Area = π × R^2 Area = 3.142 × 3^2 Area = 28.278 mm^2 Accept range (28.274 – 28.278) mm^2 (1 mark) 1 mark for correct **substitution** of Force and Area P = F / A F = 50N A = their 28.278 mm^2 P = 50 / their 28.278 (1 mark) 1 mark for **completing calculation** P (Pressure) = 1.7681 N/mm^2 Accept range (1.7681 – 1.7684) N/mm^2 (1 mark) 1 mark for giving answer to **2 DP** P = 1.77 N/mm^2 (1 mark) **correct answer** **Pressure = 1.77 N/mm^2 or their 1.77 N/mm^2**	5 marks	AO2

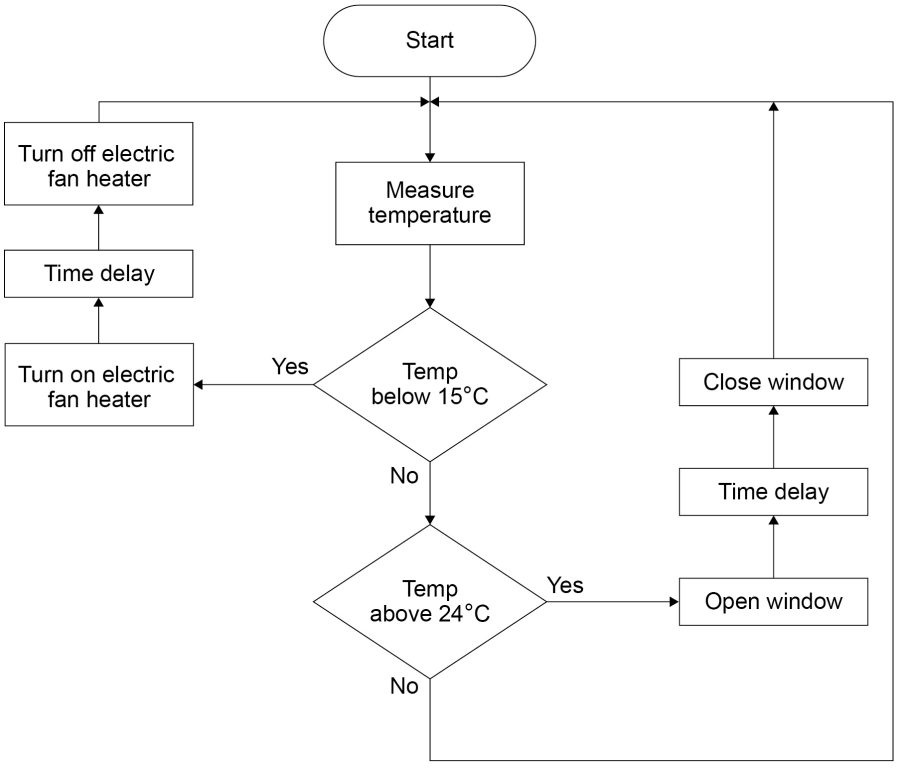
Qu	Part	Marking Guidance	Total marks	AO
05	**1**	Award **one** mark for an identification and **one** additional mark for the explanation (2 marks total). **Indicative content** • An alloy is a combination of two or more metals whereas a composite is a mixture of two materials. • An alloy is where the metals are chemically bonded together whereas a composite is where two (or more) materials remain physically distinct. • An alloy will have a uniform cross section whereas in a composite material the layers/fibres/particles will be visible. Accept all other valid responses.	2 marks	AO1b

Qu	Part	Marking Guidance	Total marks	AO
05	**2**	**Low carbon steel** Also accept mild steel Do not accept steel/ high carbon steel	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
05	**3**	Award **one** mark for an identification and **one** additional mark for the explanation (2 marks total). Combination of concrete and metal bars increases toughness. (1) Concrete is excellent under compression whereas metal bars have good tensile strength. (2) Accept all other valid responses.	2 marks	AO1b

Qu	Part	Marking Guidance	Total marks	AO
05	**4**	Award up to **three** marks. Allow error carried forward (ECF) if values incorrectly substituted. If correct answer (**6800 N or 6.8 KN**) is given without workings, award full marks. 1 mark for **re-arranging formula** Stress (σ) = Force (F) / Area (A) Force (F) = Stress (σ) × Area (A) (1 mark) 1 mark **for correct substitution** of Stress and Area Force = Stress × Area Stress = 17 N/mm^2 A = 400 mm^2 Force = 17 × 400 (1 mark) 1 mark for **completing calculation** Force = 6800 N (1 mark) **correct answer** **Pressure = 6800 N or their 6800 N (also accept 6.8 KN)**	3 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
06	**1**	**Transistor or FET** Also accept MOSFET, Field effect Transistor, motor driver IC (L293D) or relay	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
06	**2**	1 mark for each of the below correctly positioned on the diagram • Turn off heater • Time delay • Feedback loop from heater side of flowchart to underneath start box • Arrows linking the two boxes from the turn on electric fan heater command **Illustrative Diagram**  	4 marks	AO2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>06</td><td>3</td><td>Award up to six marks for a correct answer.

<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>3</td><td>5–6</td><td>Good clear notes and/or sketching showing how test is undertaken to ensure reliability. Notes clarify the sketching, adding additional information and considerations.</td></tr>
<tr><td>2</td><td>3–4</td><td>Either sketching and/or notes used which largely show test but omits some information. Some details about reliability but not fully explained.</td></tr>
<tr><td>1</td><td>1–2</td><td>Limited sketching or notes which do not fully address the question. No or very limited comments about reliability.</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>

Indicative content

• Explanation of sensor used (explanation of how the sensor works is not required).
• Names of sensors such as heat sensor, thermistor.
• Comments on location of sensor, in particular with respect to reliability.
• Inclusion of frame or jig to ensure measurement is taken at the same place each time.
• Comments on maintaining ambient intake temperature.
• Comment on isolating test from external factors such as draughts.
• Comments on maintaining humidity consistent.
• Comments on recording outcomes of the test.

Accept all other valid responses.</td><td>2 marks

4 marks</td><td>AO1b

AO2</td></tr>
</table>

Qu	Part	Marking Guidance	Total marks	AO
06	**4**	Award **one** mark for each test (Max 2 marks) Award up to **two** further marks per test for a detailed explanation of why the test is required (Max 4 marks) **Indicative content** • Voltage/current measurement– to check how much power is being used to ensure supply is sufficient. • Noise test – to check whether sound deadening is required so that noise is at an acceptable/comfortable level. • Electrical insulation/isolation test – to ensure that there is no danger of injury from electrocution. • Heater temperature test– to check that the heater temperature is safe to touch and will not cause a burn injury. • Airflow rate test – to check that the heat gets to all parts of greenhouse and no hot spots. • Energy measurement/energy usage/efficiency – to check how much power is being used to ensure energy efficiency. Accept all other valid responses.	2 marks 4 marks	AO1a AO1b

Qu	Part	Marking Guidance	Total marks	AO
06	**5**	Correct answer: **Heater 4**	1 mark	AO1b

Qu	Part	Marking Guidance	Total marks	AO
06	**6**	Award up to **three** marks. Allow error carried forward (ECF) if values incorrectly substituted. If correct answer (**31 °C**) is given without workings, award full marks. 1 mark for **understanding** that **Mean** = average temperature change (1 mark) Mean = sum of Temp Changes / Number of Heaters 1 mark for **calculation** of **sum of Temp Changes** Sum of temp Changes = 155 (1 mark) 1 mark for **calculation of mean** Mean = sum of Temp Changes / Number of Heaters Mean = 155 / 5 Mean = 31 °C (1 mark) **correct answer** **Mean = 31 °C or their 31 °C** Also accept 32.25**°C** if students have removed the outlier (26**°C**) and worked out the mean of the 4 remaining heaters.	3 marks	AO2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>07</td><td></td><td>
<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>4</td><td>7–8</td><td>Demonstrates a comprehensive knowledge of engineering lifespan and the factors affecting it. Evidence of evaluation of planned obsolescence, maintenance requirements and use of sealed parts/products.</td></tr>
<tr><td>3</td><td>5–6</td><td>Demonstrates a good knowledge of engineering lifespan and the factors affecting it. At least two of the aspects evaluated.</td></tr>
<tr><td>2</td><td>3–4</td><td>Demonstrates some knowledge of engineering lifespan. Some limited aspects evaluated.</td></tr>
<tr><td>1</td><td>1–2</td><td>A limited level of detail given.</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

Planned Obsolescence

• Understanding that parts of products could wear out through use (such as hinges, bearings, moving parts, buttons, USB charging port).
• Understanding that technology may move forward making supporting older products increasingly difficult or expensive.
• Understanding that older products may not have the latest features.
• Older products may not comply with new legislation/regulations.
• Understanding that planned obsolescence encourages customers to replace older products with newer versions (producing future sales).

Maintenance requirements

• Understanding that maintenance may be difficult or not cost effective in complex products.
• Maintenance may require specialist equipment or personnel which may not be available (such as battery or screen replacement).

Use of sealed parts/products

• Sealed parts protect the product from environmental factors (waterproof etc).
• Sealed products (such as a mobile phone) can make minor repairs not cost effective or impossible.
• Protection of intellectual rights of manufacturer as products cannot be easily opened.
• Can create more waste to be recycled/disposed of as products cannot be repaired.
</td><td>4 marks

4 marks</td><td>AO3a

AO3b</td></tr>
</table>

		• New legislation 'right to repair' may affect how manufacturers make products. • Charge capacity of sealed rechargeable batteries will reduce over time. Accept all other valid responses.		

Qu	Part	Marking Guidance	Total marks	AO
08	1	**OR gate** Accept Exclusive OR (EOR) gate, XOR and EXOR. Also accept the correct symbol.	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
08	2	Award up to **four** marks. Allow error carried forward (ECF) if values incorrectly substituted. If correct answer (**137.75 K Ohm (Ω) or 137K75 Ohm (Ω)**) is given without workings, award full marks. 1 mark for **conversion** R2 = 2250 Ohm (Ω) R2 = 2.25K Ohm (Ω) **Or** Rt = 140K Ohm (Ω) Rt = 140000 Ohm (Ω) (1 mark) 1 mark for **re-arranging formula** Rt = R1 + R2 Therefore R1 = Rt – R2 (1 mark) 1 mark for **correct substitution** of Resistances (Rt = 140K Ohm (Ω) (140000), R2 = 2.25K Ohm (Ω) (2250) R1 = Rt – R2 R1 = 140 – 2.25 (140000-2250) (1 mark) 1 mark for **completing calculation** R1 = 137.75K Ohm (Ω). (1 mark) **correct answer** **R1 = 137.75K Ohm (Ω) or their 137.75K Ohm (Ω)** **Also accept in the form**	4 marks	AO2

		R1 = 137K75 Ohm (Ω) or their 137K75 Ohm (Ω)		

Qu	Part	Marking Guidance	Total marks	AO
08	**3**	Award up to **five** marks. Allow error carried forward (ECF) if values incorrectly substituted. If correct answer (**718p (£7.18)**) is given without workings, award full marks. 1 mark for understanding that there are **multiples of some components.** 2 switches at 21p each total 42p 4 screws at 2p each total 8p (1 mark) 1 mark for both **unit conversions** (1 mark) 1 mark for calculating **labour cost** 20 mins at 1260p per 60 mins Labour cost = 1260 / 60 × 20 Labour Cost = 420p (1 mark) 1 mark for **summing** their costs Cost = 130 + 75 + 42 + 43 + 8 + 420 (1 mark) 1 mark for **completing their calculation** Cost = 718p (£7.18) (1 mark) **correct answer** **Cost = 718p (£7.18) or their 718p (£7.18)**	5 marks	AO2

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>08</td><td>4</td><td>
<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>3</td><td>5–6</td><td>Demonstrates a good understanding of the differences including advantages and disadvantages between switches and sensors, in relation to the needs of the manufacturer and user. Most points evaluated.</td></tr>
<tr><td>2</td><td>3–4</td><td>Demonstrates some knowledge of the difference between switches and sensors including advantages and/or disadvantages. More than one point evaluated.</td></tr>
<tr><td>1</td><td>1–2</td><td>A limited range of points given, with very little evaluation</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>
Indicative content

Needs of the manufacturer

• Sensors may not need to be mounted on the top allowing more aesthetic designing.
• Switches have moving parts which may fail whilst many sensors do not.
• Switches are digital whilst most sensors are analogue.

Impact on the manufacturer

• Sensors are likely to need additional electronics.
• Sensors will need tuning to be effective.
• Sensors may require a re-design of the case to be effective.
• Sensors can be less expensive than switches, depending on their specification.

Needs of user

• Sensor may be easier to use/although may be triggered accidentally.
• Timer could be voice, motion or light activated.
• Sensors may not need to be mounted visibly allowing for more ergonomic designs.
• Sensors may be easier to use for people with disabilities.
• User needs to be more precise when pressing a switch rather than triggering a sensor.

Accept all other valid responses.
</td><td>3 marks

3 marks</td><td>AO3a

AO3b</td></tr>
</table>

<table>
<tr><th>Qu</th><th>Part</th><th>Marking Guidance</th><th>Total marks</th><th>AO</th></tr>
<tr><td>09</td><td>1</td><td>Award up to four marks for analysing benefits of a hand cutting process

<table>
<tr><th>Level</th><th>Marks</th><th>Description</th></tr>
<tr><td>2</td><td>3–4</td><td>Good understanding shown of more than one benefit of a suitable hand cutting process.</td></tr>
<tr><td>1</td><td>1–2</td><td>Basic understanding shown of only one benefit of a suitable hand cutting process.</td></tr>
<tr><td>0</td><td>0</td><td>No response or nothing worthy of credit.</td></tr>
</table>

Note

Accept any suitable hand cutting process such as guillotine, sawing, hand or foot shears if sufficient justification is included. Do not accept portable grinding machine.

Indicative content

• The task is to cut across the whole stock sheet so shearing or guillotine is preferable.
• Cost of hand equipment is much lower than the cost of a laser cutter suitable to cut low carbon steel.
• A guillotine/shear has a quick operation time whereas a laser cutter requires more setup time.
• Cutting on a guillotine/shear can be done with the same high accuracy as a laser cutter.
• Hand cutting equipment tend to be simple tools with less maintenance requirements than a laser cutter.
• Hand cutting equipment can be portable and so could be moved and used to any location whereas a laser cutter is less portable, requires a larger working area and electrical power.
• Hand cutting processes do not create dust/fumes (a laser cutter does) so does not need fume extraction.
• Sawing is a possible method but reference to accuracy or quality of cut should be made.

Accept all other valid responses.</td><td>4 marks</td><td>AO3a</td></tr>
</table>

Qu	Part	Marking Guidance	Total marks	AO
09	2	Award **one** mark for an identification and **one** additional mark for the explanation (2 marks total). **Indicative content** • Tolerance is the amount of acceptable error in accuracy (identification). • Tolerance is the permissible limits in variation of the required size (Identification). • So that products fit together (explanation). • So that products perform as expected (explanation). Accept all other valid responses.	1 mark 1 mark	AO1a AO1b

Qu	Part	Marking Guidance	Total marks	AO
09	3	Correct answer: Vernier calliper, digital calliper, digital vernier, micrometer Do not accept ruler, measuring tape, steel rule or just callipers.	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
09	4	Award **one** mark for each precaution (up to two marks) and **one** additional mark for each reason (up to two marks). **Indicative content** • Wear specific laser eye protection – lasers can be reflected from surface and can damage eyesight permanently. • Ensure material selected is laser cutter safe, use fume extraction – laser fumes may be toxic or harmful causing short or long-term health problems. • Wear ear protection – laser and fume extractor may be noisy which may cause hearing damage. • Ensure laser height is correct – laser could collide with work piece causing damage to machine or work; or laser to be reflected in an uncontrolled way. • Ensure power settings are correct – laser could be too strong and cause a fire. • Do not open or interrupt machine whilst in operation – there may be reflected laser light which can cause injury. • Ensure laser cutter is not left unattended while running – as any issues, such as fire can be dealt with immediately.	2 marks 2 marks	AO1a AO3a

		Do not accept safety goggles/goggles/mask as not specific for using a laser. Accept all other valid responses.		