



GCSE ENGINEERING 8852/W

Unit 1 Written Paper

Mark scheme

June 2022

Version: 1.0 Final



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.

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

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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	B A mixture including metallic materials	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	2	C Hardening	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	3	D Polyurethane	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	4	D Thrust	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	5	C Stiffness	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	6	B Light emitting diode	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	7	C 7 Segment Display	1 mark	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
01	8	<p>Award one mark for each correct response as shown in bold.</p> <p>Composites are materials made by combining/ layering two or more different materials.</p> <p>They can have properties/textures that are not possible in individual materials.</p> <p>A disadvantage of composites is that they are difficult to separate and cannot be easily recycled.</p>	3 marks	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
02	1	<p>Award up to three marks for three correctly identified reasons.</p> <p>Indicative content</p> <ul style="list-style-type: none"> • Durable, hardwearing, tough, hard. • Non-toxic. • Doesn't require a finish. • Withstand high temperatures./ high melting point. • Can be formed into variety of shapes /malleable. (Malleable without being qualified would not be accepted.) • Aesthetically pleasing. • Corrosion resistant/ doesn't rust. • Doesn't react with food. • Easier to clean than other metals. <p>Accept all other valid responses.</p>	3 marks	AO1 1b

Qu	Part	Marking Guidance	Total marks	AO																		
02	2	<table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>4</td> <td>Detailed explanation including all key processes in the correct order as shown in the indicative content.</td> </tr> <tr> <td>3</td> <td>3</td> <td>Majority of key processes covered in the correct order, with some detail.</td> </tr> <tr> <td>2</td> <td>2</td> <td>Some processes identified but lacks detail, insufficient detail for correct or complete manufacture.</td> </tr> <tr> <td>1</td> <td>1</td> <td>One basic process identified.</td> </tr> <tr> <td>0</td> <td>0</td> <td>No response or nothing worthy of credit.</td> </tr> </tbody> </table>	Level	Marks	Description	4	4	Detailed explanation including all key processes in the correct order as shown in the indicative content.	3	3	Majority of key processes covered in the correct order, with some detail.	2	2	Some processes identified but lacks detail, insufficient detail for correct or complete manufacture.	1	1	One basic process identified.	0	0	No response or nothing worthy of credit.	4 marks	AO1 1b
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4	4	Detailed explanation including all key processes in the correct order as shown in the indicative content.																				
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		<p>Indicative content</p> <p>Marking out Mark out 2 holes on the sheet material or mark out one hole on overlapping sheets of material.</p> <p>Drilling Drill two holes in the material or one hole in overlapping sheets of material.</p> <p>Rivet insertion Insert the rivet through the hole.</p> <p>Hammering ends or rivet gun The ends of the rivet are hammered over to hold the material in place or insert the end of the rivet pin into the rivet gun and squeeze the trigger until the material is pulled tightly together.</p> <p>Accept all other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO																		
02	3	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 15%;">Level</th> <th style="width: 15%;">Marks</th> <th style="width: 70%;">Description</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>4</td> <td>Two risks selected and both explained in detail.</td> </tr> <tr> <td>3</td> <td>3</td> <td>One risk selected with two reasons explained or two risks selected with one explained.</td> </tr> <tr> <td>2</td> <td>2</td> <td>One risk selected with one reason explained or two risks selected with no/inadequate explanation.</td> </tr> <tr> <td>1</td> <td>1</td> <td>One risk selected.</td> </tr> <tr> <td>0</td> <td>0</td> <td>No response or nothing worthy of credit.</td> </tr> </tbody> </table> <p>Possible risks:</p> <ul style="list-style-type: none"> • eye damage • injury from moving machine parts • injury/poor quality manufacture due to moving material • items catching on moving parts causing injury • inadequate manufacturing standard • machine not fastened to the floor • the hole could be drilled in the wrong place • the drill could get stuck in the work – not tightened • select the wrong drill. • No emergency stop. • Guard too small, doesn't cover whole of drill bit. • Unsecured parts of the machine. <p>Indicative content</p>	Level	Marks	Description	4	4	Two risks selected and both explained in detail.	3	3	One risk selected with two reasons explained or two risks selected with one explained.	2	2	One risk selected with one reason explained or two risks selected with no/inadequate explanation.	1	1	One risk selected.	0	0	No response or nothing worthy of credit.	4 marks	AO3b
Level	Marks	Description																				
4	4	Two risks selected and both explained in detail.																				
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		<ul style="list-style-type: none"> • Could get dust/swarf in your eye – must use PPE. • Injury from moving parts – guard must be down during operation. • Material should be clamped down when being drilled – risk of injury from spinning material or poor-quality manufacture. • Hair should be tied back, aprons fastened, sleeves rolled up etc to avoid being pulled into the machine causing injury. • Machine could cause injury if it topples over. • Machine not correctly maintained, does not work correctly, resulting in inadequate manufacture. • Drill bit incorrectly inserted/not tightened resulting in inadequate manufacture/injury. • Unsecured parts of the machine, such as the table, may move and cause injury. <p>Accept all other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO
02	4	Award one mark for recall of formula:	1 mark	AO1a
		$\frac{\text{Driven}}{\text{Driver}} = \text{Gear Ratio}$ <p>Award up to two marks for calculation:</p> <p>152/85 = 1.78823 (one mark)</p> <p>Answer to 2 decimal places = 1.79 (one mark)</p> <p>Marks may still be awarded for the calculation using the candidate's own formula. Full marks are awarded for a correct answer, even if no working out shown.</p>	2 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
02	5	<p>Award one mark for rearranging the formula to:</p> $\text{Speed driven gear} = \text{Speed driver gear} \times \frac{\text{N driver}}{\text{N driven}}$ <p>Award one mark for calculation:</p> $1430 \times \left(\frac{85}{152}\right) = 800 \text{ rpm}$ <p>Accept answer range [798, 801]</p> <p>Alternative method:</p> $1430 \div \text{their } \frac{152}{85} \text{ (one mark allowed for correct calculation)}$	2 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
02	6	<p>Award up to two marks for a full explanation of both processes or award one mark for an explanation of a single process.</p> <p>Indicative content</p> <ul style="list-style-type: none"> • In a pillar drill, the drill rotates and the work doesn't rotate. • On a lathe, the work rotates and the drill doesn't rotate. • Pillar drill cuts vertically into material to create a hole. • Lathe drills horizontally into material to create a hole. <p>Accept all other valid responses.</p>	2 marks	AO1a

Qu	Part	Marking Guidance	Total marks	AO
02	7	<p>Award one mark for each correct answer.</p> <p>Part A Process = Face milling, milling, planing, shaping, facing off.</p> <p>Part B Process = Slot milling, slotting, end milling, routing, shaping, milling.</p>	2 marks	AO1a

Qu	Part	Marking Guidance	Total marks	AO
03		<p>Award up to two marks for suitable material properties.</p> <p>Indicative content</p> <p>Properties</p> <p>Structural concrete:</p> <ul style="list-style-type: none"> • strong in tension and compression due to combination of concrete and steel • durable. <p>Structural timber:</p> <ul style="list-style-type: none"> • high strength to weight ratio • tensile strength. <p>Award up to two marks for an advantage of each material.</p> <p>Indicative content</p> <p>Advantages</p> <p>Structural concrete:</p> <ul style="list-style-type: none"> • concrete can be reinforced to improve properties • commonly used, readily available • weather resistant • inexpensive with justification. • can be supplied precast • can be mixed/poured on site • can be moulded into all kinds of shapes. <p>Structural timber:</p> <ul style="list-style-type: none"> • is a natural material • sustainable • can be recycled • readily available • easily worked • easily connected • less dense. • low energy consumption in manufacture <p>Award up to two marks for a disadvantage of each material.</p> <p>Indicative content</p> <p>Disadvantages</p> <p>Structural concrete:</p> <ul style="list-style-type: none"> • is a composite material which can be difficult to separate and therefore difficult to recycle 	6 marks	AO3a

		<ul style="list-style-type: none"> environmental impact, high CO2 emissions high energy consumption in manufacture. <p>Structural timber:</p> <ul style="list-style-type: none"> can rot so must be treated to prolong use insect damage can warp and twist combustible deforestation if not a managed forest. <p>Accept all other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO																		
04	1	<table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>4</td> <td>At least two points, justified with comparison and explained in detail.</td> </tr> <tr> <td>3</td> <td>3</td> <td>Two points made, justified with comparison.</td> </tr> <tr> <td>2</td> <td>2</td> <td>Two points made and justified.</td> </tr> <tr> <td>1</td> <td>1</td> <td>One point made, limited detail.</td> </tr> <tr> <td>0</td> <td>0</td> <td>No response or nothing worthy of credit.</td> </tr> </tbody> </table> <p>Indicative content</p> <p>Standard forms:</p> <ul style="list-style-type: none"> available in bulk so unit price is lower readily available so saves time, more efficient, lower production costs universal sizes so manufacturing can be done anywhere often at a lower cost transport, storage and packaging easier. <p>Custom made:</p> <ul style="list-style-type: none"> specialised process/tooling may be required, cost of manufacture will increase custom sizes can increase waste, more material required increase in cost to manufacturer passed on to customer custom made may require more expensive material so cost will increase more skilled labour, increasing cost. <p>Accept all other valid responses.</p>	Level	Marks	Description	4	4	At least two points, justified with comparison and explained in detail.	3	3	Two points made, justified with comparison.	2	2	Two points made and justified.	1	1	One point made, limited detail.	0	0	No response or nothing worthy of credit.	4 marks	AO3a
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Qu	Part	Marking Guidance	Total marks	AO
04	2	Award up to four marks.	4 marks	AO2

		<p>Materials:</p> <p>$£1.72 \times 47 = £80.84$ (1 mark) $£3.06 \times 32 = £97.92$ (1 mark)</p> <p>$80.84 + 97.92 + 7.75 = £186.51$ (1 mark)</p> <p>Total costs: Material + labour = Total cost</p> <p>$186.51 + 45.00 = £231.51$ (1 mark)</p> <p>Must be to 2d.p. due to working with money.</p>		
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Qu	Part	Marking Guidance	Total marks	AO
04	3	<p>Award up to two marks.</p> <p>$\frac{\text{their } 231.51}{100} \times 37$ or 85.6587 (1 mark)</p> <p>their 231.51 + their 85.6587 = £317.17 (1 mark)</p> <p>Alternative method</p> <p>their 231.51 \times 1.37 (1 mark)</p> <p>£317.17 (1 mark)</p> <p>Must be to 2d.p. due to working with money.</p>	2 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO															
04	4	<p>Award up to six marks.</p> <table border="1"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>5–6</td> <td>Thorough evaluation of a range of factors that must be considered with examples.</td> </tr> <tr> <td>2</td> <td>3–4</td> <td>Clear evaluation of factors that must be considered with an example or thorough evaluation with no examples.</td> </tr> <tr> <td>1</td> <td>1–2</td> <td>Basic description with or without one or two factors identified.</td> </tr> <tr> <td>0</td> <td>0</td> <td>No response or nothing worthy of credit.</td> </tr> </tbody> </table>	Level	Marks	Description	3	5–6	Thorough evaluation of a range of factors that must be considered with examples.	2	3–4	Clear evaluation of factors that must be considered with an example or thorough evaluation with no examples.	1	1–2	Basic description with or without one or two factors identified.	0	0	No response or nothing worthy of credit.	6 marks	AO3b
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		<p>Indicative content</p> <ul style="list-style-type: none"> • Material availability. • Material size required. • Material end of life. • Manufacturing process required. • Specific properties required. • User requirements. • Suitable manufacturing processes. • Environmental impact. <p>Accept all other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO
04	5	<p>Award one mark for a correct process of any PS type.</p> <p>Indicative content</p> <p>Press forming, vacuum forming, injection moulding, extrusion, hot wire cutting, bending, laser cutting.</p> <p>Award up to two marks for correct explanation.</p> <p>Indicative content</p> <ul style="list-style-type: none"> • The process heats the polystyrene making it softer so it can be moulded into shape. • Polystyrene products can be made in high volume quickly and efficiently. • The process moulds the polystyrene to make identical products. • The process creates less waste as polystyrene can be reheated and reshaped. • The process burns a fine line of the shape giving a clean finish. <p>Marks may be awarded even if no process or incorrect process named.</p> <p>Accept all other valid responses.</p>	<p>1 mark</p> <p>2 marks</p>	<p>AO1 1a</p> <p>AO 1b</p>

Qu	Part	Marking Guidance	Total marks	AO
04	6	<p>Award up to two marks for a correct answer. Either a well explained answer or two simple points for two marks.</p> <p>Indicative content</p> <ul style="list-style-type: none"> • Changes the properties of the material. • Increases strength. • More durable, lasts longer. 	<p>1 mark</p> <p>1 mark</p>	<p>AO1 1a</p> <p>AO1b</p>

		<ul style="list-style-type: none"> • Increased strength to weight ratio. • Lightweight. • High strength/weight ratio. • Good resistance to corrosion. • Elasticity. • Good fatigue resistance. <p>Accept all other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO
05	1	<p>Correct answers</p> <p>Part A – Chuck</p> <p>Part B – Tailstock – stock on its own is not accepted.</p> <p>Also accept a detailed description of its function.</p>	2 marks	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
05	2	<p>Correct answer</p> <p>Tool name – Centre drill. Accept Slocombe drill. Do not accept drill.</p> <p>Used for – Cutting tool that is pushed into the end of the rotating workpiece to create pilot hole or countersink.</p>	<p>1 mark</p> <p>1 mark</p>	<p>AO1 1a</p> <p>AO1b</p>

Qu	Part	Marking Guidance	Total marks	AO
05	3	<p>Calculate an angle using trigonometry</p> <p>Use of tan/tan <i>chosen</i> (1 mark)</p> $\tan \theta = \frac{22}{106} \quad \text{or} \quad \theta = \tan^{-1} \left(\frac{22}{106} \right) \quad (1 \text{ mark})$ <p>Answer = [11.69, 11.73] (1 mark)</p> <p>Award any other alternative method.</p> <p>Full marks are awarded for a correct answer, even if no working out shown.</p>	3 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO																								
05	4	Award one mark for each correct answer.	3 marks	AO1 1a																								
		<table border="1"> <thead> <tr> <th>Order</th> <th>Process</th> <th>Hand Tools</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Mark out the coat hook shape</td> <td>Scriber, steel rule</td> <td>Mark out the size of the coat hook and the position of the holes with a steel ruler and a scriber.</td> </tr> <tr> <td>2</td> <td>Cut out the shape</td> <td>Hacksaw/ coping saw</td> <td>Secure the work piece in the vice and saw to remove excess material.</td> </tr> <tr> <td>3</td> <td>Make the holes</td> <td>Centre punch, drill</td> <td>Centre punch the position of the holes. Clamp the work piece and drill through the material.</td> </tr> <tr> <td>4</td> <td>Refine the edges and holes</td> <td>File, deburring tool, countersink, emery cloth</td> <td>Move the file against the material to smooth the edges and deburr the holes.</td> </tr> <tr> <td>5</td> <td>Bend to correct angle</td> <td>Mallet and vice or bending jig/ template or adjustable bevel, bending press</td> <td>Set the work piece in the vice and tap with a mallet or use the jig/ template/bevel to bend the metal to shape.</td> </tr> </tbody> </table>	Order	Process	Hand Tools	Description	1	Mark out the coat hook shape	Scriber, steel rule	Mark out the size of the coat hook and the position of the holes with a steel ruler and a scriber.	2	Cut out the shape	Hacksaw/ coping saw	Secure the work piece in the vice and saw to remove excess material.	3	Make the holes	Centre punch, drill	Centre punch the position of the holes. Clamp the work piece and drill through the material.	4	Refine the edges and holes	File, deburring tool, countersink, emery cloth	Move the file against the material to smooth the edges and deburr the holes.	5	Bend to correct angle	Mallet and vice or bending jig/ template or adjustable bevel, bending press	Set the work piece in the vice and tap with a mallet or use the jig/ template/bevel to bend the metal to shape.	3 marks	AO2
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Accept all other valid responses. Mark may be awarded if cutting process is described for stage two description box.																												

Qu	Part	Marking Guidance	Total marks	AO
05	5	<p>Award one mark for each correct process.</p> <p>Process – Drilling, routing, milling, stamping, punching, laser cutting, water jets, die press. Do not accept press on its own.</p> <p>Accept all other valid responses.</p>	2 marks	AO1 1a

Qu	Part	Marking Guidance	Total marks	AO
06	1	Correct answer Analogue signal	1 mark	AO1a

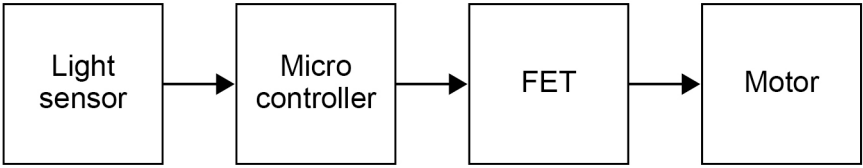
Qu	Part	Marking Guidance	Total marks	AO
06	2	Award one mark for a correct answer. Indicative content <ul style="list-style-type: none"> • More versatile, can produce a range of different tones. • Can be used with a microcontroller and PIC programming software. • Thin and compact, suitable for small application. • Uses less power. • Changes frequency. Accept all other valid response.	1 mark	AO1b

Qu	Part	Marking Guidance	Total marks	AO
06	3	Award up to two marks for two methods identified. Or Award one mark for a method identified and one mark for an explanation. Indicative content <ul style="list-style-type: none"> • Use modelling software. • Use CAD simulation. • Test the circuit with a physical prototype. • Perform calculations, flowcharts. Accept all other valid responses.	2 marks	AO1b

Qu	Part	Marking Guidance	Total marks	AO
06	4	Rearrange the formula to $I = V/R$ (1 maths mark) $\frac{6}{250} = 0.024$ (substitute the numbers 1 maths mark)	4 marks	AO2

		0.024 = 24 mA or 0.024 A (1 maths mark) Award one mark for naming the correct unit (1 science mark) Full marks are awarded for a correct answer, even if no working out shown.		
Qu	Part	Marking Guidance	Total marks	AO
06	5	Award up to two marks for a correct answer. To reduce the flow of current (one mark), therefore protecting the component from damage (one mark).	2 marks	AO1b

Qu	Part	Marking Guidance	Total marks	AO
06	6	Award one mark for a simple, unjustified but relevant statement. Award two marks for a correct and justified or explained statement. Indicative content When an input is from a variable source such as a temperature sensor or a LDR. The output from the sensor is analogue so a convertor is needed to convert to digital output so it can be read and processed by a microcontroller. Accept all other valid responses.	2 marks	AO1b

Qu	Part	Marking Guidance	Total marks	AO
06	7	Award one mark for each component in the correct order. Award one mark for boxes drawn as part of a systems diagram left to right. Award one mark for arrows drawn as part of a systems diagram left to right.  <pre> graph LR A[Light sensor] --> B[Micro controller] B --> C[FET] C --> D[Motor] </pre>	6 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
06	8	<p>Award one mark for a simple, unjustified and relevant statement.</p> <p>Award two marks for a correct and justified or explained statement.</p> <p>Indicative content</p> <ul style="list-style-type: none"> • The motorised blind can be opened and closed with less effort than the manual blind. • The motorised blind is easier to operate, touch button. • The motorised blind can be used with a remote control, the manual blind is hand operated. • The motorised blind can be programmed and used with a timer. • The motorised blind removes the need for pull cords or winding mechanism improving safety. • The manual blind has a simple winding mechanism and does not require a power source. <p>Accept all other valid responses.</p>	2 marks	AO3a

Qu	Part	Marking Guidance	Total marks	AO
07	1	<p>Correct answer</p> <p>Fossil fuels – gas, coal, oil, petrol, diesel, nuclear.</p>	1 mark	AO1a

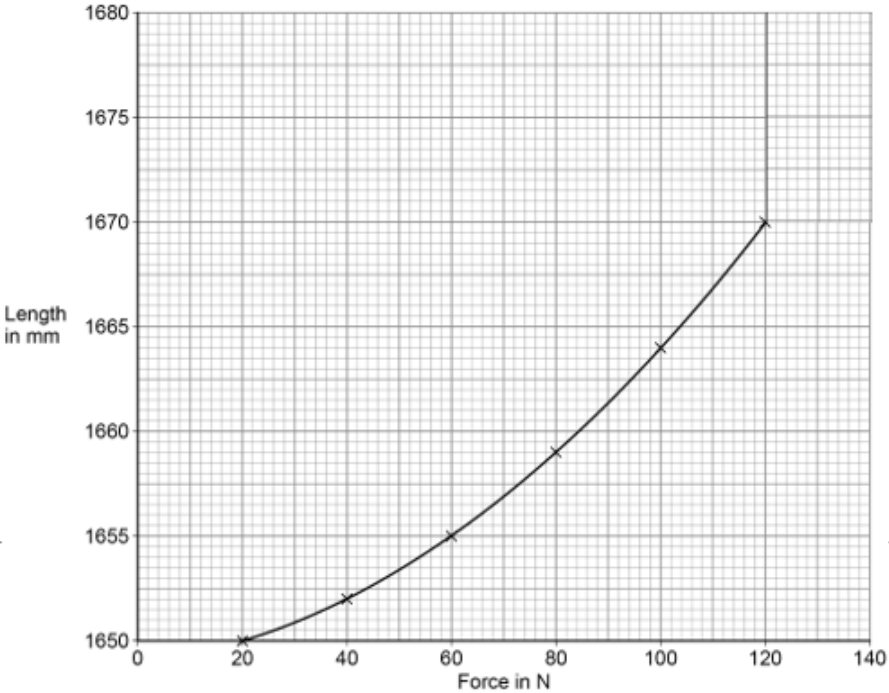
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<p>Indicative content</p> <p>Tidal energy – any form of tidal – tidal pull.</p> <p>Advantages</p> <ul style="list-style-type: none"> • More consistent than wind power as the tide is always moving. • It can be located where it is not an eyesore, turbine blades can be under water. • Could be combined with a wind farm above water. • Does not produce greenhouse gases. <p>Disadvantages</p> <ul style="list-style-type: none"> • Difficult to set up due to location. • Difficult to maintain due to location. • Costs more to set up than wind power. • May interfere with shipping routes. <p>Environmental impact</p> <ul style="list-style-type: none"> • May have an adverse effect on the ecosystem. • May be harmful to wildlife. <p>Wind energy – any form of wind.</p> <p>Advantages</p> <ul style="list-style-type: none"> • Electricity is produced at very low cost. • Cost effective compared to fossil fuels. • Clean, constant energy source. 																						

		<ul style="list-style-type: none"> • Can be sited offshore so less visual impact. • Small carbon footprint. <p>Disadvantages</p> <ul style="list-style-type: none"> • Only produce energy when there is wind, wind is variable. • May need to shut down if too windy. • Methods needed to store the energy which adds costs and reduces efficiency. • Expensive setup costs of building the turbines. • Spoil the look of the landscape. • Can be noisy. • Maintenance. <p>Environmental impact</p> <ul style="list-style-type: none"> • May impact on the local bird population. • May impact the landscape. <p>Accept all other valid responses.</p>		
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Qu	Part	Marking Guidance	Total marks	AO
08	1	<p>Award up to three marks.</p> <p>Stress = F/A</p> <p>Radius = 0.8 mm (1 mark)</p> <p>$0.8 \times 0.8 \times \pi = [2.0096, 2.01088] \text{ mm}^2$ (1 mark)</p> <p>$\frac{70}{[2.0096, 2.01088]} = [34.8, 35]$ (1 mark)</p> <p>Full marks are awarded for a correct answer, even if no working out shown. Accept alternate methods.</p>	3 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
08	2	<p>Correct answer</p> <p>Tension or tensile force.</p>	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO															
08	3	<p data-bbox="320 338 1002 371">Award up to six marks for a suitable testing method.</p> <table border="1" data-bbox="320 405 1217 745"> <thead> <tr> <th data-bbox="320 405 451 439">Level</th> <th data-bbox="451 405 582 439">Marks</th> <th data-bbox="582 405 1217 439">Description</th> </tr> </thead> <tbody> <tr> <td data-bbox="320 439 451 526">3</td> <td data-bbox="451 439 582 526">5–6</td> <td data-bbox="582 439 1217 526">Thorough description of a suitable testing method with supporting sketches.</td> </tr> <tr> <td data-bbox="320 526 451 613">2</td> <td data-bbox="451 526 582 613">3–4</td> <td data-bbox="582 526 1217 613">Clear description of a suitable testing method with or without a sketch.</td> </tr> <tr> <td data-bbox="320 613 451 701">1</td> <td data-bbox="451 613 582 701">1–2</td> <td data-bbox="582 613 1217 701">Basic description of a potentially feasible testing method.</td> </tr> <tr> <td data-bbox="320 701 451 745">0</td> <td data-bbox="451 701 582 745">0</td> <td data-bbox="582 701 1217 745">No response or nothing worthy of credit.</td> </tr> </tbody> </table> <p data-bbox="320 786 576 819">Indicative content</p> <p data-bbox="320 853 1150 987">End of the cable held in a clamp Weight is hung from the other end Length of the cable is measured and then the weight increased. Repeat with more weights</p> <p data-bbox="320 1021 357 1055">Or</p> <p data-bbox="320 1088 1118 1200">The cable is used with the brake lever and increasing force is applied. Force could be applied over varying time lengths</p> <p data-bbox="320 1234 357 1267">Or</p> <p data-bbox="320 1301 1174 1335">Description of specialist machine used for testing tensile strength.</p> <p data-bbox="320 1368 743 1402">Accept all other valid responses.</p>	Level	Marks	Description	3	5–6	Thorough description of a suitable testing method with supporting sketches.	2	3–4	Clear description of a suitable testing method with or without a sketch.	1	1–2	Basic description of a potentially feasible testing method.	0	0	No response or nothing worthy of credit.	6 marks	AO2
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Qu	Part	Marking Guidance	Total marks	AO
08	4	<p>Award:</p> <p>One mark for labelling the horizontal and vertical axes.</p> <p>Two marks for accurate plotting of data points (One mark per three correct data points).</p> <p>One mark for drawing a smooth curved line connecting the points.</p> <p>No marks were given for drawing the graph up to 140N.</p> <p>Example graph:</p> 	4 marks	AO2

Qu	Part	Marking Guidance	Total marks	AO
08	5	<p>Correct answer</p> <p>1667 mm (1 maths mark)</p> <p>[1666, 1668]</p>	1 mark	AO2

Qu	Part	Marking Guidance	Total marks	AO
08	6	Correct answer Ductility, elasticity, malleability.	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
09	1	Award one mark for a suitable process. Indicative content Fused deposition modelling Stereolithography 3D Printing Award all other valid responses.	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
09	2	Award up to two marks for two suitable advantages. Indicative content <ul style="list-style-type: none"> • Product is made in a single operation. • Can create complex parts. • Operates more quickly than conventional machining. • Parts can be modified quickly and easily. • Products with internal features can be made. • Allows for evaluation and testing of the product. • Faster product development • Check for errors • Make models to share with customers/clients to make changes prior to production. Do not accept quicker or rapid. Award all other valid responses.	2 marks	AO1b