



52/w

GCSE ENGINEERING 8852/W

Unit 1 Written Paper

Mark scheme

June 2019

Version: 1.0 Final

196g8852/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 Assessment Writer.

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

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.

Qu	Part	Marking Guidance	Total marks	AO
1	1	<p>2 marks for AO1a (knowledge)</p> <p>Correct answers: B Brass C Bronze</p> <p>Note: If a candidate shades more than 2 lozenges, deduct 1 mark for each additional shaded lozenge.</p>	2 marks	AO1a
1	2	<p>1 mark for AO1a (knowledge)</p> <p>Correct answer: C Malleability</p>	1 mark	AO1a
1	3	<p>3 marks for AO1b (understanding)</p> <p>Award 1 mark for each correct response.</p> <p>Annealing is a heat treatment process which reduces the hardness of a material, and helps to increase its ductility. Some materials, like copper, can be cooled quickly during the annealing process by quenching.</p>	3 marks	AO1b
1	4	<p>1 mark for AO1a (knowledge)</p> <p>Correct answer: D Welding</p>	1 mark	AO1a
1	5	<p>1 mark for AO1a (knowledge)</p> <p>Correct answer: C > 35 mm</p>	1 mark	AO1a
1	6	<p>1 mark for AO1a (knowledge)</p> <p>Correct answer: B $P=F/A$</p>	1 mark	AO1a
1	7	<p>1 mark for AO1a (knowledge)</p> <p>Correct answer: C Structural concrete</p>	1 mark	AO1a

Qu	Part	Marking Guidance	Total marks	AO
2	1	<p>4 marks for AO3 (analyse)</p> <p>Award 1 mark for each point made up to 2 marks for differences, and 2 marks for shared characteristics.</p> <p>Note: only award 1 mark if an answer is ‘flipped’. E.g. Steel is heavier than aluminium, and aluminium is lighter than steel’ would gain 1 mark.</p> <p>Indicative content:</p> <p>Differences (max 2 marks):</p> <ul style="list-style-type: none"> Steel is heavier Aluminium is more expensive Aluminium is more malleable than steel Steel is more prone to corrosion Aluminium can be anodised different colours Steel can be galvanised Steel is stronger than aluminium Steel is Ferrous <p>Shared characteristics (max 2 marks):</p> <ul style="list-style-type: none"> Both are durable Both materials are strong, having good tensile strength and stiffness Both materials are readily available Both materials conduct electricity 	4 marks	AO3
2	2	<p>2 marks for AO3(analyse)</p> <p>Ease of manufacture (max 2 marks):</p> <p>Award 1 mark for a simple statement, and 2 marks for a justified or explained point.</p> <p>Examples of 1 mark responses:</p> <ul style="list-style-type: none"> Aluminium is more malleable than steel Welding steel is easier than aluminium Aluminium is easier to handle and move during manufacture Stock control is easier when using aluminium Steel is available in a wider range of stock forms. <p>Examples of 2 mark responses:</p> <ul style="list-style-type: none"> Aluminium is more malleable than steel so less force is needed when shaping it Welding steel is easier than aluminium so less skilled workers are needed Aluminium is lighter so easier to handle during manufacture Aluminium is less prone to corrosion, so stock control is easier 	2 marks	AO3

		Steel is available in a wider range of stock forms, so easier to obtain.		
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Qu	Part	Marking Guidance	Total marks	AO
3	1	<p>4 marks for AO1b (understanding)</p> <p>Award 1 mark for each relevant advantage (max 2 marks) and for each relevant disadvantage (max 2 marks).</p> <p>Indicative content:</p> <p>Advantages of using a chain and sprocket: Stronger and harder to snap Durable and won't wear out Will transmit a lot of power without breaking Grip is not affected by weather/water Will not 'slip' as a belt could A chain is flexible</p> <p>Disadvantages of a chain and sprocket: Needs maintenance – oiling, lubricating, tightening Will stretch over time Heavier than a belt Noisy Difficult to adjust tension Expensive to replace Can be 'dirty' as they have oil on them</p>	4 marks	AO1b
3	2	<p>1 mark for AO1a (knowledge) and 2 marks AO2 (application of knowledge and understanding)</p> <p>Award 1 mark for recall of formula: Gear ratio = Number of teeth on driven gear/ number of teeth on driver gear</p> <p>Award 1 mark for evidence of transposition (maths mark):</p> <p>Number of teeth on driven gear = gear ratio x teeth on driver gear</p> <p>Or 1:3 x 13</p> <p>Award 1 mark for correct answer: 39 teeth, or just 39. (maths mark)</p>	3 marks	AO1a and AO2
3	3	<p>2 marks AO2 (application of knowledge and understanding)</p> <p>Award 1 mark for evidence of calculation $1500/225 = 6.666$ (maths mark) Note: the response must include evidence that the saw-cut of 2 mm has been considered</p> <p>Award 1 mark for correct answer: 6 axles (maths mark for rounding down)</p>	2 marks	AO2

3	4	<p>4 marks for AO1b (understanding) and 4 marks AO2 (application of knowledge and understanding)</p> <table border="1" data-bbox="304 344 1192 759"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>7-8</td> <td>Detailed explanation including all key processes to produce product.</td> </tr> <tr> <td>3</td> <td>5-6</td> <td>Majority of processes covered including most key processes to produce product. Some areas lacking detail.</td> </tr> <tr> <td>2</td> <td>3-4</td> <td>Some processes described in basic detail/list form OR majority of processes covered but insufficient detail to allow correct or complete manufacture.</td> </tr> <tr> <td>1</td> <td>1-2</td> <td>One or more basic processes/steps listed.</td> </tr> <tr> <td></td> <td>0</td> <td>Nothing of relevance or no response.</td> </tr> </tbody> </table> <p>Through the use of notes and/or sketches candidates should be awarded marks based on covering the key stages as follows: Suggestion of use of PPE Place material in chuck, use of chuck key Safety guards in place Set tool height/speeds/feeds Face Turn diameter, perhaps in steps. Reverse bar in chuck and repeat (give credit for use of a steady as overhang from the chuck is large)</p> <p>Or, if turning between centres; Suggestion of use of PPE Place material in chuck, use of chuck key Safety guards in place Set tool height/speeds/feeds Face Centre-drill Reverse in chuck, face and centre Use of carrier Place between centres Turn diameters.</p>	Level	Marks	Description	4	7-8	Detailed explanation including all key processes to produce product.	3	5-6	Majority of processes covered including most key processes to produce product. Some areas lacking detail.	2	3-4	Some processes described in basic detail/list form OR majority of processes covered but insufficient detail to allow correct or complete manufacture.	1	1-2	One or more basic processes/steps listed.		0	Nothing of relevance or no response.	8 marks	AO1b and AO2
Level	Marks	Description																				
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3	5	<p>2 marks for AO1a (knowledge)</p> <p>Award 1 mark for each tool, up to 2 marks.</p> <p>Accept: Vernier calipers, micrometer, digital caliper, digital Vernier.</p>	2 marks	AO1a
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3		<p>1 mark for AO1a (knowledge) and 5 marks AO2 (application of knowledge and understanding)</p> <p>Calculation of area of washer: Award 1 mark for evidence of recalling the formula for area $A=\pi r^2$</p> <p>Award 1 mark for showing understanding that area of washer = 3.142 x 225 – 3.142 x 169 (maths mark)</p> <p>or 3.142 x 15² – 3.142 x 13²</p> <p>or 3.142 x (30/2)² – 3.142 x (26/2)²</p> <p>Award 1 mark for answer 175.95</p> <p>Award 1 mark for calculating the area of the steel blank 32 x 32 = 1024 (maths mark)</p> <p>Award 1 mark for area of scrap 1024 – area of washer = 848.05 (maths mark)</p> <p>[accept 848 to 848.2]</p> <p>Award 1 mark for % calculation (848.05/1024) x 100 = 82.81% (maths mark).</p> <p>[accept 82.8]</p> <p>Note:</p> <ul style="list-style-type: none"> • units not needed during working. • Accept alt. methods i.e. if volume used to calculate waste 	6 marks	AO1a and AO2
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3	7	<p>2 marks for AO1b (understanding)</p> <p>Award 1 mark for each relevant and correct reason (max 2 marks)</p> <p>Indicative content: Improve corrosion resistance Improve a part's resistance to scratching and damage Improve the appearance (aesthetics) Change the colour of a part To increase/reduce electrical conductivity. To increase size.</p>	2 marks	AO1b
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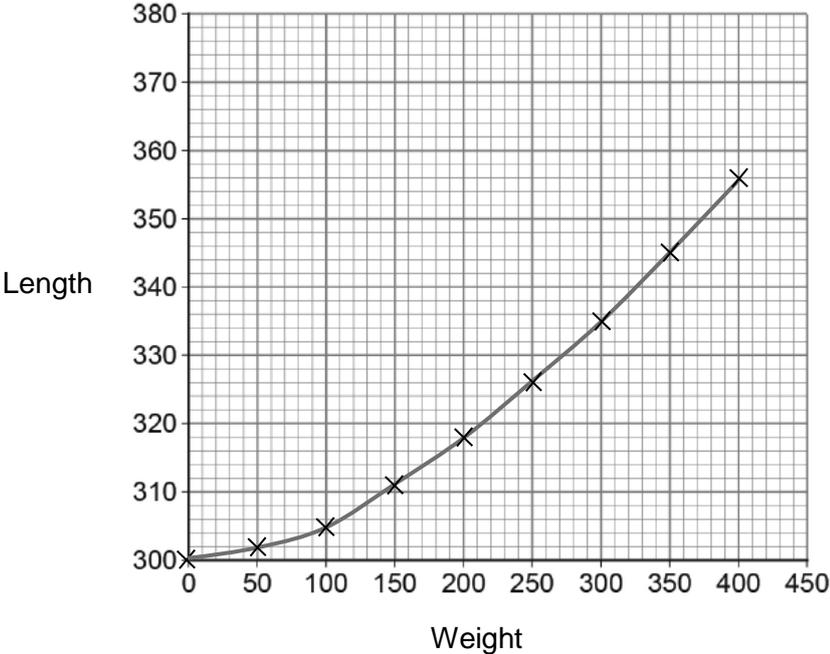
3	8	1 mark for AO1a (knowledge)	1 mark	AO1a
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		Accept: Galvanising, electroplating, zinc plating		
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Qu	Part	Marking Guidance	Total marks	AO
4	1	<p>1 mark for AO1b (understanding) and 2 marks AO2 (application of knowledge and understanding)</p> <p>Award 1 mark for an appropriate non-metallic suitable material named. E.g. pine, oak, fibre reinforced polymer (FRP), glass reinforced plastic (GRP), ABS.</p> <p>Do not accept generic terms like wood, plastic.</p> <p>Award 1 mark for each relevant reason appropriate to the material named even if the material is not appropriate (eg metallic material). (up to 2 marks max).</p> <p>Indicative content: Lightweight Durable Weather/corrosion resistant (in the case of polymers) Weather/corrosion resistant once treated (in the case of timbers) Good tensile strength Good compressive strength Environmentally sustainable (in the case of timbers) Electrically non-conducting.</p>	3 marks	AO1b and AO2
4	2	<p>1 mark for AO1a (knowledge) and 2 marks AO2 (application of knowledge and understanding)</p> <p>Award 1 mark for recall of the formula. (Award the mark if the working shows that the correct formula has been used)</p> <p>The formula is: $A^2 = B^2 + C^2$ Or Hyp = $\sqrt{a^2 + b^2}$ Or similar.</p> <p>Award 1 mark for substitution of the height of the ladder and distance from the wall (1 maths mark)</p> <p>Examples: $A^2 = 5^2 + 2^2$ $Hyp = \sqrt{5^2 + 2^2}$ $A^2 = 5000^2 + 2000^2$ Or similar</p>	3 marks	AO1a and AO2

		Award 1 mark for correct answer in mm (1 maths mark) Correct answer: 5385 (mm)		
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Qu	Part	Marking Guidance	Total marks	AO
5	1	1 mark for AO1a (knowledge) Correct answer: Tension or Tensile force	1 mark	AO1a
5	2	2 marks for AO2 (application of knowledge and understanding) Award 1 mark for calculation of change in length: $356-300 = 56$ (maths mark for interpreting data from table) Award 1 mark for calculation of strain : $56/300 = 0.187$ (maths mark) (accept 0.19) Note: Do not award 2 nd mark if candidate includes units (e.g. 0.187mm)	2 marks	AO2
5	3	2 marks for AO2 (application of knowledge and understanding) Award 1 mark for calculation of % change: $(335/300) \times 100 = 111.666$ (maths mark) Therefore the wire is 11.66% longer after having the weight applied. Award 1 mark for giving answer to one decimal place: 11.7% (maths mark)	2 marks	AO2

5	4	<p>4 marks for AO2 (application of knowledge and understanding)</p> <p>Award: 1 mark for labelling vertical axis: length, length of wire or similar</p> <p>1 mark for labelling horizontal axis: weight, weight applied or similar (maths)</p> <p>1 mark for evidence of accurate plotting of data points (maths mark)</p> <p>1 mark for drawing a smooth curved line connecting the points (maths mark)</p> <p>Example of a response worth 4 marks:</p> 	4 marks	AO2
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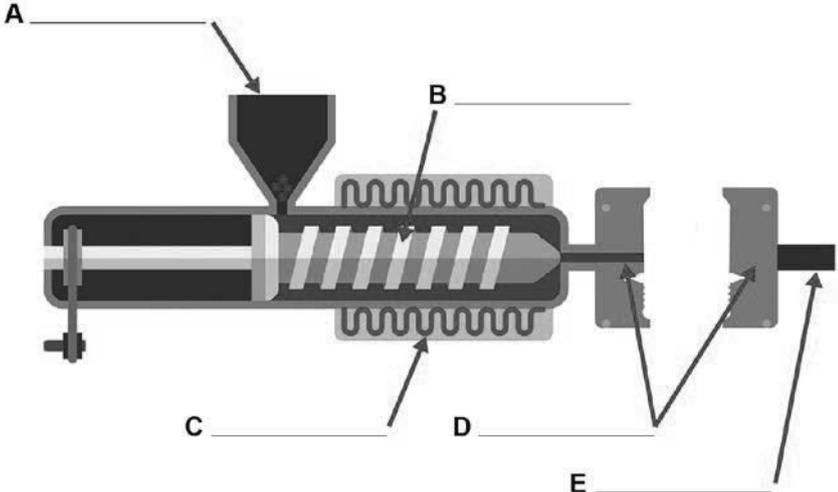
5	5	<p>1 mark for AO2 (application of knowledge and understanding)</p> <p>Award 1 mark for giving a value between 366 and 371 based on extrapolation of the graph. (1 maths mark)</p>	1 mark	AO2
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Qu	Part	Marking Guidance	Total marks	AO
6	1	<p>2 marks for AO1a (knowledge) and 2 marks for AO1b (understanding).</p> <p>Award 1 mark for each correct term:</p> <p>Part A is a cam and part B is a follower.</p> <p>The mechanism converts rotary motion into reciprocating motion.</p>	4 marks	AO1a and AO1b
6	2	<p>1 mark for AO1a (knowledge)</p> <p>Award 1 mark for bearing, ball-bearing, roller bearing or bearing race.</p>	1 mark	AO1a
6	3	<p>2 marks for AO1b (understanding)</p> <p>Award 1 mark for each correct point made (max 2 marks)</p> <p>Accept:</p> <ul style="list-style-type: none"> Control motion Restrict motion Prevent 'play' or loose components Reduce friction in the mechanism Reduce the amount of heat generated Allow components to move freely Reduce wear 	2 marks	AO1b

Qu	Part	Marking Guidance	Total marks	AO
7		<p>1 mark for AO1a (knowledge) and 4 marks AO2 (application of knowledge and understanding)</p> <p>Award: 1 mark for evidence of recall of formula</p> <p>Accept:</p> $V_c = A_c \times L$ <p>or Volume = Area x Length or $V = CSA \times L$</p> <p>1 mark for evidence of transposition (maths mark)</p> <p>Accept:</p> $L = V_c / A_c$ <p>or Length = Volume / area or $L = V / CSA$</p> <p>1 mark for calculation of area of circle (maths mark)</p> $\pi \times 35^2 = 3848.9$ <p>accept range of 3846 – 3849</p> <p>1 mark for evidence of understanding that 1ml = 1000mm³ (maths mark)</p> <p>1 mark for calculation of answer (maths mark)</p> $L = 750000 / \text{area of circle} = \mathbf{194.85 \text{ to } 195 \text{ mm.}}$ <p>Note: Units of mm or cm needed in final answer.</p> <p>Candidates can work in cm:</p> <p>Award: 1 mark for evidence of recall of formula</p> <p>Accept:</p> $V_c = A_c \times L$ <p>or Volume = Area x Length or $V = CSA \times L$</p> <p>1 mark for evidence of transposition (maths mark)</p> <p>Accept:</p> $L = V_c / A_c$ <p>or Length = Volume / area or $L = V / CSA$</p> <p>1 mark for calculation of area of circle (maths mark)</p> $\pi \times 3.5^2 = 38.48$ <p>accept range of 38.46 – 38.49</p> <p>1 mark for evidence of understanding that 1ml = 1000mm³ (maths mark)</p>	5 marks	AO1a and AO2

		1 mark for calculation of answer (maths mark) $L = 750000 / \text{area of circle} = 19.48 \text{ to } 19.5 \text{ cm.}$		
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Qu	Part	Marking Guidance	Total marks	AO
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8	1	<p>5 marks for AO1a (knowledge)</p> <p>Award 1 mark for each correctly identified part. (max 5 marks)</p>  <p>A: Hopper, or feeder B: Screw C: Heaters, or heating coils D: Mould, split mould, or die E: Ram, or hydraulic ram or ejector pin</p> <p>Note: The responses do not have to have the exact wording in order to gain credit.</p>	5 marks	AO1a
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8	2	<p>3 marks for AO1b (understanding)</p> <p>This is a 3 mark item, so brief correct responses would gain a mark. However, generic or very vague responses e.g. quick, easy, cheap would not be credited.</p> <p>Indicative content: Fast production method Identical parts produced Many parts can be made at the same time Low cost parts after initial costs Parts can be made in lots of different colours Low skilled workers can operate the machine Can mould around metal inserts Or similar relevant and correct responses.</p>	3 marks	AO1b
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8	3	<p>1 mark for AO1a (knowledge), 2 marks for AO1b (understanding)</p> <p>Award 1 mark for naming a thermoplastic (ABS, acrylic, nylon, polycarbonate, polystyrene, polycaprolactone)</p> <p>Award 1 mark for a simple, unjustified reason given (max 1 mark)</p> <p>Award a second mark for further relevant, correct detail</p> <p>E.g. Softens when heated (1) so can be forced into a mould (1) Hardens when cooled (1) and so retains its shape (1) Self-finishing (1) so little further work needed (1) Available in a variety of colours (1), you just need to change the colour of the raw material (1) Material can be recycled/reused (1) as the material can be re-heated and used again (1)</p> <p>Note: Generic or very vague responses e.g. quick, easy, cheap would not be credited.</p>	3 marks	AO1a and AO1b
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8	4	<p>3 marks for AO3 (analyse) and 6 marks for AO3 (evaluate).</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Level</th> <th style="text-align: center;">Mark</th> <th style="text-align: left;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">7-9</td> <td>Demonstrates a comprehensive knowledge of the impact of rapid prototyping and automated processes. Evidence of analysis, including several advantages and disadvantages of using this technology, and has evaluated the benefits against other production methods. A good range of examples of processes and products given.</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">4-6</td> <td>Demonstrates a good level of knowledge of the impact of rapid prototyping and automated processes. Only advantages or disadvantages of using this technology given, along with a range of examples of processes and products. Some evidence, even brief, of evaluation against other production methods.</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1-3</td> <td>A limited level of detail given. Only advantages or disadvantages of using this technology given, with very little analysis or evaluation.</td> </tr> <tr> <td></td> <td style="text-align: center;">0</td> <td>Nothing of relevance or no response.</td> </tr> </tbody> </table> <p>Indicative content:</p>	Level	Mark	Description	3	7-9	Demonstrates a comprehensive knowledge of the impact of rapid prototyping and automated processes. Evidence of analysis, including several advantages and disadvantages of using this technology, and has evaluated the benefits against other production methods. A good range of examples of processes and products given.	2	4-6	Demonstrates a good level of knowledge of the impact of rapid prototyping and automated processes. Only advantages or disadvantages of using this technology given, along with a range of examples of processes and products. Some evidence, even brief, of evaluation against other production methods.	1	1-3	A limited level of detail given. Only advantages or disadvantages of using this technology given, with very little analysis or evaluation.		0	Nothing of relevance or no response.	9 marks	AO3
Level	Mark	Description																	
3	7-9	Demonstrates a comprehensive knowledge of the impact of rapid prototyping and automated processes. Evidence of analysis, including several advantages and disadvantages of using this technology, and has evaluated the benefits against other production methods. A good range of examples of processes and products given.																	
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1	1-3	A limited level of detail given. Only advantages or disadvantages of using this technology given, with very little analysis or evaluation.																	
	0	Nothing of relevance or no response.																	

	<p>Candidate responses may include (but are not limited to) factors such as:</p> <p>3-D printing:</p> <ul style="list-style-type: none"> • Allows rapid prototyping of products – must be justified (no credit for repeating the question) • Cost effective for one-off or bespoke solutions • Flexible design (in terms of shape/complexity) • Allows design concept to quickly become modelled • Possible to create complex shapes with reduced section area/thickness leading to efficient design • High strength-to-weight ratio allowing less material to be used • Ability to create complex shapes in one piece • Can have high set-up costs • Require specialist training/software <p>Automated processes:</p> <ul style="list-style-type: none"> • May result in job losses • High speed production rates, reducing costs • Accurate and repeatable process • High initial tooling/set-up costs • Complex shapes can be produced. 		
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Qu	Part	Marking Guidance	Total marks	AO
9	1	<p>4 marks for AO3 (analyse)</p> <p>Award 1 mark for each correct and relevant requirement (up to a maximum of 2 marks)</p> <p>Plus: Award 1 mark for each correct reason related to a given requirement (up to a maximum of 2 marks).</p> <p>Content could include: (note: this list is not exhaustive and any other correct requirements and reasons must be credited)</p> <p>Requirement: The code needs a minimum of 4 digits Reason: To prevent the door opening just by having a guess</p> <p>Requirement: Only a small number of attempts can be made to enter the code Reason: To stop someone having lots of chances to guess the code</p> <p>Requirement: The case needs to be water-proof and weather-proof Reason: To prevent corrosion and failure of the system.</p> <p>Note: Accept reasonable and relevant responses where a candidate has mentioned a user requirement, rather than a system requirement. For example, accept:</p> <p>Requirement: An intercom speaker could be included Reason: So someone visiting could speak to a member of staff</p>	4 marks	AO3

9	2	<p>3 marks for AO3 (evaluate)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Level</th> <th style="text-align: center;">Mark</th> <th style="text-align: center;">Description</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">3</td> <td>A justified choice of a method which is based on their analysis and takes account of the context. Discussion of both methods.</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> <td>A choice of a method made based on their analysis with a limited reference to the context.</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>A choice is made with weak reference to either their analysis or the context.</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>No answer worthy of credit.</td> </tr> </tbody> </table> <p>Indicative Content: (note: this list is not exhaustive and any other correct and relevant points made must be credited)</p> <p>Keypad: No chance of losing a swipe-card No limit to the number of authorised people A less-expensive system to install and maintain The code can be re-programmed No need to produce cards People can forget the code The code can be passed on to unauthorised people</p> <p>Magnetic swipe-card: People don't need to memorise a code Greater control over who is authorised to enter the door More expensive in the long-term as cards need to be manufactured Cards can be lost or damaged</p>	Level	Mark	Description	3	3	A justified choice of a method which is based on their analysis and takes account of the context. Discussion of both methods.	2	2	A choice of a method made based on their analysis with a limited reference to the context.	1	1	A choice is made with weak reference to either their analysis or the context.	0	0	No answer worthy of credit.	3 marks	AO3
Level	Mark	Description																	
3	3	A justified choice of a method which is based on their analysis and takes account of the context. Discussion of both methods.																	
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1	1	A choice is made with weak reference to either their analysis or the context.																	
0	0	No answer worthy of credit.																	

9	3	<p>3 marks for AO2 (apply).</p> <p>Marks awarded for naming specific components that would work in the circuit.</p> <p>Input: Push to make switch, PTM, pressure pad, reed switch, LDR , infra-red sensor, PIR</p> <p>Process: Microcontroller, PIC, counter, display driver chip, 4026, 4017 or similar suitable component</p> <p>Output: 7 segment display, LED array, liquid crystal display.</p>	3 marks	AO2
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Qu	Part	Marking Guidance	Total marks	AO
10	1	<p>2 marks for AO1 (knowledge) and 2 marks for AO2 (application of knowledge and understanding).</p> <p>Award 1 mark for writing Ohm's Law formula: Current= voltage /resistance Or $I=V/R$</p> <p>Award 1 mark for showing correct substitution of 6 for voltage and 220 for resistance in the working. (maths mark)</p> <p>Award 1 mark for correct answer (maths mark) Accept: 0.027 0.027 27</p> <p>Award 1 mark for correct units that match the answer 0.027 amps 0.027A 27mA</p>	4 marks	AO1 and AO2
10	2	<p>1 marks for AO1a (knowledge) and 1 mark for AO2 (application of knowledge and understanding).</p> <p>Award 1 mark for a simple, unjustified and relevant statement. Award 2 marks for a correct and justified or explained statement.</p> <p>For example: To turn the circuit off (1) in order to save the battery (1) To control the circuit (1) as the light is not always needed (1)</p> <p>Indicative content: To turn the circuit off To control the circuit There is no point having the torch on if not needed To extend battery life To save power For environmental reasons – saving battery, extending product life.</p>	2 marks	AO1a and AO2

Qu	Part	Marking Guidance	Total marks	AO																		
11		<p>4 marks for AO3 (analyse) and 4 marks for AO3 (evaluate)</p> <table border="1" data-bbox="304 506 1197 1155"> <thead> <tr> <th>Level</th> <th>Marks</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>7-8</td> <td>Demonstrated a comprehensive knowledge of the different aspects of each location with a thorough analysis of the advantages and disadvantages of each. Has evaluated both locations. A good range of aspects considered, and not simply 'flipped' points made. Maintenance and environmental factors considered.</td> </tr> <tr> <td>3</td> <td>5-6</td> <td>Demonstrated a good knowledge of the different aspects. Has analysed and evaluated both locations, and a range of aspects discussed.</td> </tr> <tr> <td>2</td> <td>3-4</td> <td>Has discussed both locations, and evaluated one positive and one negative for both environmental and maintenance aspects.</td> </tr> <tr> <td>1</td> <td>1-2</td> <td>Demonstrated a limited knowledge of the different aspects of each location with a basic analysis of the pros and cons of each.</td> </tr> <tr> <td></td> <td>0</td> <td>Nothing of relevance or no response.</td> </tr> </tbody> </table> <p>Indicative content:</p> <p>Candidate responses may include (but are not limited to) factors such as:</p> <p>Land-based:</p> <ul style="list-style-type: none"> Normally easier to gain access for maintenance Some locations are in very remote places Less changeable weather conditions Easier to transport workers and spare parts to location Can have a significant effect on visual impact Turbines are noisy and annoying to local residents Take-up valuable agricultural land <p>Off-shore:</p> <ul style="list-style-type: none"> Time/money to get workers to the site Dangerous sea conditions Tend to be much bigger turbines so hazards with working at greater heights Have to consider tidal conditions Less visual impact No noise issues for people Greater corrosion issues with salt water More difficult to transport tools and equipment off shore 	Level	Marks	Description	4	7-8	Demonstrated a comprehensive knowledge of the different aspects of each location with a thorough analysis of the advantages and disadvantages of each. Has evaluated both locations. A good range of aspects considered, and not simply 'flipped' points made. Maintenance and environmental factors considered.	3	5-6	Demonstrated a good knowledge of the different aspects. Has analysed and evaluated both locations, and a range of aspects discussed.	2	3-4	Has discussed both locations, and evaluated one positive and one negative for both environmental and maintenance aspects.	1	1-2	Demonstrated a limited knowledge of the different aspects of each location with a basic analysis of the pros and cons of each.		0	Nothing of relevance or no response.	8 marks	AO3
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Qu	Part	Marking Guidance	Total marks	AO
12	1	1 mark for AO2 (application of knowledge and understanding). Correct answer: C	1 mark	AO2
12	2	1 mark for AO2 (application of knowledge and understanding). Correct answer: C	1 mark	AO2
12	3	2 marks for AO2 (application of knowledge and understanding). Explain why a FET is used in the system – up to 2 marks. Award: 1 mark for suggesting that the logic component/process may not be powerful enough to drive the buzzer or sound output, or similar language. 1 mark for a specific reference to current .	2 marks	AO2