



GCSE

Engineering

48501
Mark scheme

48501
June 2017

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 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.

| Question | Part | Marking Guidance | Mark | Comments |
|----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|
| 1 | (a)(i) | <p>Name a suitable metal which could be used to manufacture the case.</p> <p>Stainless Steel Aluminium Titanium Gold</p> <p>[1 mark for correct answer]</p> | 1 | |

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| 1 | (a)(ii) | <p>Describe two benefits to the manufacturer of using the metal that you have named in part (a)(i), to make the case.</p> <p>Award 1 mark for simple response, 2 for well explained. ie.</p> <p>Malleable (1) Malleable which allows it to be pressed into shape (2) Lightweight (1) so is more portable (2) Can be machined (1) Can be machined allowing a variety of shapes (2)</p> <p>Hard wearing / durable material (1) so will have longer lifespan (1) Can be polished/etched (1) for desired surface finish (1) Can be machined/formed into shape (1)</p> <p>Only award full marks if properties are relevant to the chosen material.</p> <p>Materials are recyclable (1) Materials are abundant/readily available (1)</p> <p>[1 mark for simplistic response, 2 marks for response with justification. Max 4]</p> | 4 | If the material given in 1(a)i is <u>not</u> metal but statements are correct, award 2 marks max. |
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| 1 | (a)(iii) | <p>Metal alloys are often used in the manufacture of products. Explain what is meant by the term ‘metal alloy’.</p> <p>Award marks for any correct responses such as: A mixture of 2 or more elements (1) to make a material with specific/desirable properties (1) or for a given/specific application (1)</p> <p>[1 mark for each correct statement. Max 2]</p> | 2 | |
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| 1 | (b)(i) | <p>Figure 2 shows a typical pair of earphones/earbuds which could be used with an MP3 player.</p> <p>Describe the function of each labelled part.</p> <p>Cable – answers such as:</p> <ul style="list-style-type: none"> • Allows different colours to be used • Carries electrical signal to earphone • Different length allows MP3 player to be stored in pocket/bag whilst listening • Allows volume controls to be separate from the device • Insulates/protects the wire • Connects ear buds to the device <p>[1 mark per point made or 2 marks for 1 reason, explained. Max 2]</p> <p>Earpiece – answers such as:</p> <ul style="list-style-type: none"> • Grips inside the users ear to prevent falling out • Can be personalised / bespoke to provide comfort • Blocks out external noise/interference • Directs/channels sound. <p>[1 mark per point made or 2 marks for 1 reason, explained. Max 2]</p> <p>Case – answers such as:</p> <ul style="list-style-type: none"> • Provides protection to internal components • Can be decorated for aesthetics • Can be shaped to provide comfort/fit the ear <p>[1 mark per point made or 2 marks for 1</p> | 6 | Accept responses relating to the cable sleeving. |
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| | | reason, explained. Max 2] | | |
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| 1 | (b)(ii) | <p>Using notes and/or sketches explain how sound is produced by the earphones/earbuds whilst listening to an MP3 player.</p> <ul style="list-style-type: none"> • MP3 player creates electrical signal • Signal transmitted along wires • Electromagnet repels/attracts fixed magnet causing it to vibrate • Speaker cone / diaphragm vibrates and creates soundwaves which travel into users ear <p>[1 mark per point made. Max 3]</p> | 3 | |
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| Question | Part | Marking Guidance | Mark | Comments |
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| 2 | (a) | <p>Using standard drawing conventions, label the drawing below to show the two given dimensions of the plug.</p> <p>1 mark for both correctly labelled dimensions.</p> <p>3 further marks for each correct convention:</p> <p>Leader lines Solid arrows Dimension centred and above line Diameter symbol</p> <p>[Max 4]</p> | 4 | Conventions must be consistently applied. |

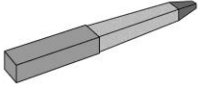
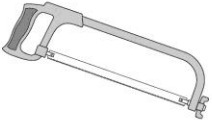
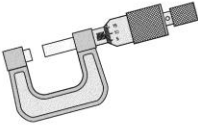
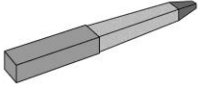
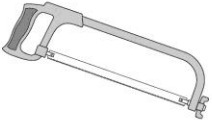
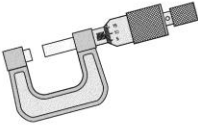
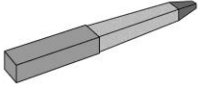
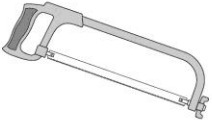
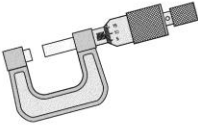
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| | | control checks. [1 mark per point made – if qualified/justified then award 2nd mark. Max 6] | | |
| 2 | (b)(iii) | <p>A component is designed to have a length of 30mm ±0.1.</p> <p>What are the acceptable finished dimensions? Show your calculations.</p> <p>29.9 mm to 30.1 mm 1 mark for 2 correct values. 1 mark for calculation.</p> | 2 | <p>Award 1 mark for correct method if value is incorrect. Award 1 mark where candidate only calculates 1 value.</p> |
| 2 | (b)(iv) | <p>Name a device which could be used to accurately check the dimensions of the product. Describe how the device would be used.</p> <p>Accept the following:</p> <p>Vernier callipers/gauge Micrometer Comparator Go nogo gauge Laser (1 mark for correct tool) Max 1</p> <p>Description such as – Place the object between the jaws of the callipers/micrometer (1) and take a reading from the scale/display (1)</p> <p>(Award 1 mark for each correct step)</p> <p>[Max 3 marks]</p> | 3 | <p>Do not accept steel rule/ruler</p> |




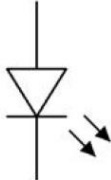

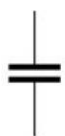







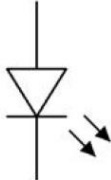

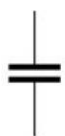








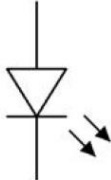

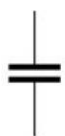




| Question | Part | Marking Guidance | Mark | Comments |
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| 3 | | <p>Personal Electronic Devices are often replaced when newer versions become available. Discuss the environmental effects when disposing of electronic devices at the end of their useful life.</p> <p>Accept answers such as:</p> <p>If not properly disposed of..... Hazardous chemicals can be released into landfill/environment Landfills are increasing in size Danger to wildlife/habitats Resources are wasted and not recycled</p> <p>If recycled..... Creates jobs Materials are reused Products can be sent to countries where recycling is not done safely H&S risk/hazard</p> <p>Marks awarded as follows:</p> <ul style="list-style-type: none"> • No answer worthy of credit (0 marks) • Simple statements based on 1 or more issues such as those outlined above. Candidate will tend to respond superficially with little detail given. Response is structured poorly with little or no use of Engineering terminology with numerous errors in grammar, punctuation and spelling. (1-2 marks) • Sound understanding of the issues with candidate commenting on 2 or more issues such as those outlined above. Response is well structured with good use of appropriate Engineering terminology. Candidate shows a good grasp of grammar, punctuation and spelling. (3-4 marks) • Excellent understanding of the issues above. Candidate comments in detail on 3 or more of the issues such as those outlined above. Response shows excellent use of engineering terminology and is well structured. Candidate displays high levels of grammar, punctuation and spelling to give a technically accurate response. If structured using bullet points then detailed sentences must be employed. (5-6 marks) <p>[Max 6]</p> | 6 | |

| Question | Part | Marking Guidance | Mark | Comments |
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| 4 | | <p>Personal Electronic devices contain Printed Circuit Boards (PCB's) which are usually manufactured using Computer Numeric Control (CNC) equipment. Explain 3 advantages to the manufacturer of using CNC equipment to make PCB's.</p> <p>Accept answers such as:</p> <p>Advantages</p> <p>Accuracy (1) because.....(1) Repeatability (1) because.....(1) Reduced risk to workforce (1) because..... (1) Reprogrammable for new designs/flexible (1) which means.....(1) Fast production method (1) because.....(1) ie Cost effective (1) when used in large scale production (1) You can save and edit ideas which make it more cost effective to modify a design. (2 marks)</p> <p>1 mark for advantage, 2nd mark for reasoning.</p> <p>[2 marks for each. Max 6]</p> | 6 | |

| Question | Part | Marking Guidance | Mark | Comments |
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| 5 | | <p>Name three health and safety hazards when using a soldering iron. For each hazard, suggest a safety measure.</p> <p>Accept answers such as:</p> <p>Hazard - safety measure: Burns – hold correctly using insulated handle, use stand when not in use or use PCB clamp whilst soldering Solder spitting - wear goggles/PPE Fumes - use extraction or work in a well ventilated area Irritation to skin caused by flux – wear barrier cream, wash hands after use Burning hair – tie long hair back. Electrocutation – regularly service and maintain equipment. Injury to others by equipment being left out – place soldering iron in stand to cool.</p> | 6 | |

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| | | Trip hazard caused by trailing cables – cable management [1 mark for each correct response. Max 6] | | |
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| 6 | | <p>The table below shows tools which are used by engineers. Complete the table by using the appropriate letter from the word/image bank opposite.</p> <table border="1" data-bbox="454 481 1139 1411"> <thead> <tr> <th data-bbox="454 481 703 526"></th> <th data-bbox="703 481 922 526">Tool name</th> <th data-bbox="922 481 1139 526">Typical use</th> </tr> </thead> <tbody> <tr> <td data-bbox="454 526 703 674"></td> <td data-bbox="703 526 922 674">Tap</td> <td data-bbox="922 526 1139 674">D</td> </tr> <tr> <td data-bbox="454 674 703 822"></td> <td data-bbox="703 674 922 822">J</td> <td data-bbox="922 674 1139 822">Used for cutting material</td> </tr> <tr> <td data-bbox="454 822 703 969">G</td> <td data-bbox="703 822 922 969">Centre punch</td> <td data-bbox="922 822 1139 969">Used to make an indent in a material</td> </tr> <tr> <td data-bbox="454 969 703 1117"></td> <td data-bbox="703 969 922 1117">Micrometer</td> <td data-bbox="922 969 1139 1117">H</td> </tr> <tr> <td data-bbox="454 1117 703 1265">F</td> <td data-bbox="703 1117 922 1265">Spring dividers</td> <td data-bbox="922 1117 1139 1265">I</td> </tr> <tr> <td data-bbox="454 1265 703 1413">E</td> <td data-bbox="703 1265 922 1413">Die</td> <td data-bbox="922 1265 1139 1413">Used for cutting external threads</td> </tr> </tbody> </table> <p data-bbox="454 1451 1034 1489">[1 mark for each correct response. Max 7]</p> | | Tool name | Typical use |  | Tap | D |  | J | Used for cutting material | G | Centre punch | Used to make an indent in a material |  | Micrometer | H | F | Spring dividers | I | E | Die | Used for cutting external threads | 7 | Accept correct comments where candidates have written a response as oppose to entering the corresponding letters. |
| | Tool name | Typical use | | | | | | | | | | | | | | | | | | | | | | | |
|  | Tap | D | | | | | | | | | | | | | | | | | | | | | | | |
|  | J | Used for cutting material | | | | | | | | | | | | | | | | | | | | | | | |
| G | Centre punch | Used to make an indent in a material | | | | | | | | | | | | | | | | | | | | | | | |
|  | Micrometer | H | | | | | | | | | | | | | | | | | | | | | | | |
| F | Spring dividers | I | | | | | | | | | | | | | | | | | | | | | | | |
| E | Die | Used for cutting external threads | | | | | | | | | | | | | | | | | | | | | | | |

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| 7 | | <p>The table below shows a range of electronic components used in personal electronic devices. Complete the table.</p> <table border="1" data-bbox="391 465 1093 1523"> <thead> <tr> <th data-bbox="391 465 625 510">Picture</th> <th data-bbox="625 465 860 510">Component Symbol</th> <th data-bbox="860 465 1093 510">Name</th> </tr> </thead> <tbody> <tr> <td data-bbox="391 510 625 714"></td> <td data-bbox="625 510 860 714"></td> <td data-bbox="860 510 1093 714">Resistor</td> </tr> <tr> <td data-bbox="391 714 625 965"></td> <td data-bbox="625 714 860 965"></td> <td data-bbox="860 714 1093 965">LED</td> </tr> <tr> <td data-bbox="391 965 625 1149"></td> <td data-bbox="625 965 860 1149"></td> <td data-bbox="860 965 1093 1149">Capacitor</td> </tr> <tr> <td data-bbox="391 1149 625 1332"></td> <td data-bbox="625 1149 860 1332"></td> <td data-bbox="860 1149 1093 1332">Motor</td> </tr> <tr> <td data-bbox="391 1332 625 1523"></td> <td data-bbox="625 1332 860 1523"></td> <td data-bbox="860 1332 1093 1523">Toggle switch</td> </tr> </tbody> </table> <p data-bbox="371 1574 957 1608">[1 mark for each correct response. Max 6]</p> | Picture | Component Symbol | Name |  |  | Resistor |  |  | LED |  |  | Capacitor |  |  | Motor |  |  | Toggle switch | 6 | <p>Also accept</p>  <p>as resistor</p> |
| Picture | Component Symbol | Name | | | | | | | | | | | | | | | | | | | | |
|  |  | Resistor | | | | | | | | | | | | | | | | | | | | |
|  |  | LED | | | | | | | | | | | | | | | | | | | | |
|  |  | Capacitor | | | | | | | | | | | | | | | | | | | | |
|  |  | Motor | | | | | | | | | | | | | | | | | | | | |
|  |  | Toggle switch | | | | | | | | | | | | | | | | | | | | |

| Question | Part | Marking Guidance | Mark | Comments |
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| 8 | (a) | <p>A client asks a designer to create a new handheld games console. Suggest 4 specification points for the new console.</p> <p>Accept valid specification points based on criteria such as:</p> <p>Dimensions related to handsizes Colour Shape Theme Screensize Game cartridge/disc size Position/location of buttons Number of buttons Function Power supply Portability/storage Material Ergonomic/anthropometric qualities Wifi capability Ease of use Cost</p> <p>Accept other valid points [1 mark for each point. Max 4]</p> | 4 | |
| 8 | (b) | <p>In the space below, sketch a design for a new console which meets specification points given in part (a). Use annotation to show how the design meets the specification.</p> <p>Up to 4 marks for addressing specification points with annotation.</p> <p>Further marks awarded as follows:</p> <p>1 – very basic sketch which shows little detail 2 – Some basic detail including identifiable features 3 – Detailed drawing with all features clearly visible.</p> <p>[Max 7]</p> | 7 | Only award full marks if all 4 specification points are addressed |

