

GCSE

Design and Technology: Industrial Technology

Unit **A545**: Sustainability and technical aspects of designing and making

General Certificate of Secondary Education

Mark Scheme for June 2017

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Centres can now access all their scripts for a fee and need to have a clear and coherent set of annotations applied to each and every paper regardless of the material area. The need for Centres to have results enquiries will be reduced if they understand exactly how papers have been marked.

All examiners of the D&T Innovator suite question papers must use these annotations.

A ✓ tick is to be used to show the correct answer.

Marks awarded must be equal to the number of ticks shown.

Banded mark scheme questions to show **L1, L2 or, L3 only** – do not use ticks.

Where a **list or bullet points** have been used to answer the Banded Mark Scheme question a **maximum mark of 2** is to be given.

| | | | |
|---|-------------------|---------------------------|---|
| BOD | BOD | Benefit of doubt | Use as appropriate |
| L1 | L1 | Level 1 | Use in banded mark scheme response only |
| L2 | L2 | Level 2 | Use in banded mark scheme response only |
| L3 | L3 | Level 3 | Use in banded mark scheme response only |
| REP | REP | Repeat | Use when response is restating the same point |
| SEEN BP | SEEN / Blank Page | Noted but no credit given | Do not use instead of a cross for a wrong answer |
|  | Tick | Tick | Ticks must be equal to the number of marks given. Do not use in banded (*) questions |

Section A

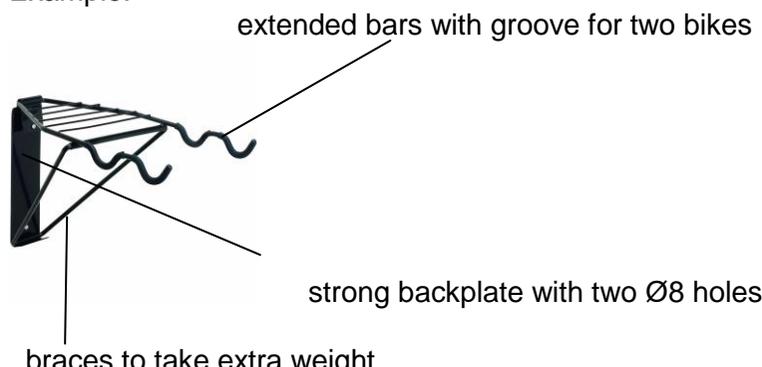
| Question | | Answer | Marks | Guidance |
|----------|--|--|-------|---|
| 1 | | c | 1 | Only acceptable answer. |
| 2 | | b | 1 | Only acceptable answer. |
| 3 | | c | 1 | Only acceptable answer. |
| 4 | | b | 1 | Only acceptable answer. |
| 5 | | a | 1 | Only acceptable answer. |
| 6 | | Any named 6R – reduce, refuse, recycle, reuse, repair, rethink | 1 | Any one acceptable answer. |
| 7 | | Polypropylene | 1 | Only acceptable answers. |
| 8 | | Dimensions concerning the human body | 1 | Reference to human body required for mark |
| 9 | | Smart materials | 1 | Only acceptable answer. |
| 10 | | Primary recycling | 1 | Only acceptable answer. |
| 11 | | False | 1 | |
| 12 | | False | 1 | |
| 13 | | True | 1 | |
| 14 | | False | 1 | |
| 15 | | True | 1 | |

Total [15]

| Question | | | Answer | Marks | Guidance |
|----------|-----|------|--|-------|--|
| 16 | (a) | (i) | European eco-label | 1 | |
| | | (ii) | Up to two marks for an explanation Examples: The label signifies that the product has a smaller environmental impact than similar products (1) with limited impact of over its life cycle (1) The label signifies that the product has a small environmental impact (1). It refers to issues such as waste production and the use of renewable resources (1) (2x1) | 2 | Reasoned explanation required for full marks Simple reference to 'eco' issues 1 mark only |
| 16 | (b) | | Up to two marks for each of two valid reasons Examples: Aluminium alloys are corrosion resistant (1) and won't rust like steel does (1) Aluminium alloy makes the cycle lighter (1) and easier / quicker to ride (1) Aluminium alloys are softer than steel (1) and easier to form into shape (1) 2 x (1+1) | 4 | 1 mark for a valid point plus one mark for reasoning NOT 'it is recyclable' |
| 16 | (c) | | Up to three marks for a clear explanation Example: The bike can be quickly disassembled and separated into parts with similar materials (1). This allows some parts to be reused (1) and the materials of other parts to be recycled / disposed of safely (1) (3x1) | 3 | Reasoned response required for full marks Simple reference to recycling 1 mark only |

| Question | | Answer | Marks | Guidance | |
|----------|------|--|-------|---|--|
| | | | | Content | Levels of Response |
| 16 | (d*) | Up to six marks for a clear and detailed explanation of the impact of material choice on carbon footprint. | | <p>Explanation may revolve around the energy use for the extraction of raw materials for the steel, aluminium and carbon fibre bikes, and the use of energy to transport them.</p> <p>The fact that wood is sustainable and has less impact on the environment as it is not extracted could be expanded on.</p> <p>The issue of processing metals and the high energy use contributing to the carbon footprint is also an issue. Steel production uses more energy than aluminium and is also a pertinent point that may arise.</p> <p>The welding of steel and aluminium frames also contributes to the carbon footprint. Whereas the manufacture of the carbon fibre, and wooden bike does not require such high energy usage for joining</p> <p>Extraction of oil for making resins for the carbon fibre bike is also an issue, and contributes to its carbon footprint.</p> | <p>Level 3 (5-6 marks) Thorough explanation, showing a clear understanding of the impact of material choice on carbon footprint. Specialist terms and examples will be used appropriately and correctly. The information will be presented in a structured format. The candidate will demonstrate the accurate use of spelling, punctuation and grammar.</p> <p>Level 2 (3-4 marks) Adequate explanation, showing an average understanding of the impact of material choice on carbon footprint. There will be some use of specialist terms and examples, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, grammar and punctuation.</p> <p>Level 1 (0-2 marks) Basic explanation, showing a limited understanding of the impact of material choice on carbon footprint. There will be little or no use of specialist terms or examples. Answers may be ambiguous, disorganised or 'list like'. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 - a response not worthy of a mark. Add 'Seen' at end of response.</p> <p>When marking 'Levels of response' questions, if answers are presented as a list of bullet points then award Level 1 maximum and specific mark, 1 or 2,</p> |

| | | | | | |
|--|--|--|--|--|---|
| | | | | | <p>dependent on quality of list.</p> <p>Do not apply ticks or annotations to 'Levels of response' questions.</p> <p>Mark these by reading all of the response, then decide on an appropriate level and a specific mark.</p> |
|--|--|--|--|--|---|

| Question | | Answer | Marks | Guidance |
|----------|-----|--|-------|---|
| 16 | (e) | <p>Two marks for each spec. point met and shown in an annotated sketch of a viable design solution.</p> <p>Example:</p>  <p>extended bars with groove for two bikes</p> <p>strong backplate with two Ø8 holes</p> <p>braces to take extra weight</p> <p>(4x1)</p> | 4 | <p>Sketch must be suitably annotated for full marks.</p> <p>It is anticipated that the candidates will extend the holding device in the manner shown to enable two bicycles to be held. Variations on supporting solutions may be numerous, but device must be viable for full marks.</p> |

Section B

| Question | | Answer | Mark | Guidance |
|----------|-----|---|--|--|
| 17 | (a) | <p>B Scriber C (Flat) file D (Twist) drill E (Taper) tap F Centre Drill G Engineer's/try square</p> <p>(6x1)</p> | 6 | |
| | (b) | <p>B C F D</p> <p>(4x1)</p> | 4 | |
| | (c) | (i) | <p>Engineer's/marking blue; layout fluid; permanent / felt marker</p> <p>1</p> | |
| | | (ii) | <p>Up to three marks for a suitable explanation</p> <p>Example: Set odd-legs to 10mm and draw lines along the sides (1) then measure 10mm from each end (1) and use a try square and scribe to draw the lines across (1) the plate.</p> <p>(3x1)</p> | <p>Must describe a workable method</p> <p>Reference to use of try square needed for full marks</p> |
| | (d) | <p>Centre punch</p> <p>1</p> | | |
| | | | | |
| 18 | (a) | (i) | <p>One mark for each of two valid reasons</p> <p>Examples:</p> | |

| Question | | Answer | Mark | Guidance |
|----------|----------------|---|----------|--|
| | | <p>Sandcasting will enable the details to be cast accurately.(1) Sandcasting is ideal for a one-off product as it is economical.(1) The letters and numbers can easily be changed on the former for different house names and numbers (1). (2x1)</p> | 2 | |
| | (ii) | <p>One mark for each of two important features Examples: The pattern must be smooth to allow it to be removed from the sand easily The sides of the former must have a draft angle for easy removal. Corners must be rounded and smooth No undercuts. Contraction allowance must be built into the pattern. Finishing allowance must be built into the pattern. (2x1)</p> | 2 | |
| | (b) | Die Casting, Shell moulding; Investment (lost-wax) casting | 1 | Must be a casting process |
| | (c) (i) | <p>Up to three marks for a clear and valid explanation. Example: Injection moulding dies are very expensive (1) and take a long time to set up on the machine (1) so it would be very expensive and inefficient to use it for just a small number (1) of products (3x1)</p> | 3 | Reasoned explanation required for full marks |
| | (ii) | <p>One mark for each of three appropriate processes Vacuum forming; blow moulding; press forming; extrusion; compression moulding; rotational moulding (3x1)</p> | 3 | Accept line bending |
| | (d) | Up to two marks for each of two justified reasons | | |

| Question | | | Answer | Mark | Guidance |
|-----------|------------|-------------|---|----------|--|
| | | | <p>Examples: Metal products usually need a finishing process (1) but plastics are available in different colours (1) Plastics do not rust (1) like steel does (1) Plastics are normally easier to form (1) and are better for mass production(1)</p> <p style="text-align: right;">2 x (2x1)</p> | 4 | <p>Justified reason required for full marks</p> <p>Not 'cheaper than metals'</p> |
| 19 | (a) | (i) | <p>Up to three marks for a clear explanation</p> <p>Response may include reference to the following: Mild steel is relatively low cost; Mild steel is readily available; Mild Steel is rigid; Mild steel can hold the weight of the basket which is relatively heavy; Scrolls can easily be formed in mild steel; Mild steel parts can be joined by welding which is inexpensive.</p> <p>Example: Mild steel is suitable for the bracket because it is a relatively strong (1) material. It is also quite inexpensive (1) and easily formed (1) into the shape of the scrolls</p> <p style="text-align: right;">(3x1)</p> | 3 | <p>Justified response required for full marks.</p> <p>List of factors – 2 marks max.</p> |
| | | (ii) | <p>A metallic mixture (1) that contains iron (1)</p> <p style="text-align: right;">(2x1)</p> | 2 | |
| | (b) | | <p>One mark for each spec. point met, plus an additional mark for an annotated sketch of a viable design solution.</p> <p style="text-align: right;">(4x1)</p> | 4 | <p>Sketch must be suitably annotated for full marks</p> |

| Question | | Answer | Marks | Guidance | |
|----------|------|---|-------|--|---|
| | | | | Content | Levels of response |
| 19 | (c)* | Up to six marks for a clear and detailed explanation, using examples, concerning the issues a manufacturer should consider when changing from one-off production methods to high-volume production. | 6 | <p>Explanation should revolve around:</p> <p>High set up costs particularly for new equipment including robots.</p> <p>Training costs for the workforce who will need to learn new skills such as use of CAD software and programming robots.</p> <p>Cost of making some workers redundant, as the new techniques will be less labour intensive.</p> <p>Possibly moving to new premises so new machines can be accommodated.</p> <p>Developing new markets/customers for the new high volume products.</p> | <p>Level 3 (5-6 marks) Thorough explanation, showing a clear understanding of the impact of changing from one-off production to high volume production. Specialist terms and examples will be used appropriately and correctly. The information will be presented in a structured format. The candidate will demonstrate the accurate use of spelling, punctuation and grammar.</p> <p>Level 2 (3-4 marks) Adequate explanation, showing an average understanding of the impact of changing from low volume to high volume production. There will be some use of specialist terms and examples, although these may not always be used appropriately. The information will be presented for the most part in a structured format. There may be occasional errors in spelling, grammar and punctuation.</p> <p>Level 1 (1-2 marks) Basic explanation, showing a limited understanding of the impact of changing from low volume to high volume production. There will be little or no use of specialist terms or examples. Answers may be ambiguous, disorganised or 'list like'. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 - a response not worthy of a mark. Add 'Seen' at end of response.</p> <p>When marking 'Levels of response' questions, if answers are presented as a list of bullet points then award Level 1 maximum and specific mark, 1 or 2, dependent on quality of list.</p> <p>Do not apply ticks or annotations to 'Levels of response' questions. Mark these by reading all of the response, then decide on an appropriate level and a specific mark.</p> |

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