OCR
Oxford Cambridge and RSA

# GCSE

# Design and Technology: Resistant Materials

Unit **A565**: 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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

**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.**
**When examiners are found not to have used these guidelines they will be graded accordingly and might not be used in future sessions.**

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.<br>Do not use in banded (*) questions |

| Question | | | Expected Answers | Marks | Rationale |
|---|---|---|---|---|---|
| 1 | | | (c) Reuse | [1] | No other response is acceptable or possible |
| 2 | | | (d) Break down naturally | [1] | No other response is acceptable or possible |
| 3 | | | (b) Coal | [1] | No other response is acceptable or possible |
| 4 | | | (b) Risk assessment | [1] | No other response is acceptable or possible |
| 5 | | | (a) Carbon credits | [1] | No other response is acceptable or possible |
| 6 | | | Trading | [1] | No other response is acceptable or possible |
| 7 | | | Carbon/eco footprint | [1] | **Accept** Co2 footprint. |
| 8 | | | Disposal | [1] | No other response is acceptable or possible |
| 9 | | | (Their) Culture/Cultural background/upbringing | [1] | |
| 10 | | | Anthropometric (data) | [1] | **Do not Accept** Ergonomics |
| 11 | | | True | [1] | No other response is acceptable or possible |
| 12 | | | False | [1] | No other response is acceptable or possible |
| 13 | | | False | [1] | No other response is acceptable or possible |
| 14 | | | True | [1] | No other response is acceptable or possible |
| 15 | | | True | [1] | No other response is acceptable or possible |
| | | | **Total** | [15] | |

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| **16** | **(a)** | | Accept any of the following **gathering methods**:<br><br>Questionnaires/surveys/Interviews/User trips/product testers/focus groups/market research/on-line research | **[1]** | **Accept** any reference to asking / collecting the opinion of the target market<br>**Do not accept**: internet (TV) |
| | **(b)** | **(i)** | ***Disassembly***<br>Taking a product/bin apart (1), for example how the different materials of the *waste bin* can be separated/taken off for recycling/product analysis(1),<br><br>Definition + explanation with reference to the bin 1+1 | **[2]** | e.g. the parts of the bin can be taken apart (1) to allow components to be replaced/ repaired (1) |
| | | **(ii)** | ***Refuse***<br>Rejecting a product, not buying/accepting/using a product/component (1) for example the tropical hardwood is not sustainable.(1)<br><br>Definition + explanation with reference to the bin 1+1<br><br>Award maximum of **1 mark** for the explanation of refuse (noun). *E.g. Refuse is rubbish. The bin is a container that holds refuse.* | **[2]** | e.g. *choosing not to buy the waste bin (1) because the use of tropical hardwood leads to deforestation (1)*<br><br>**Do not accept**: Disassemble/ disassembly/refuse in the responses. |
| | **(c)** | **(i)** | To not cover the natural grain/protect from weather/prevent rot/look nice/easy to clean | **[1]** | **Do not accept**: protect the wood (TV) |
| | | **(ii)** | Accept any **two** of the following:<br>Low odour<br>Reduced health risks<br>non-toxic fumes<br>doesn't cause headaches/asthma/nausea etc.<br>Easier to clean brushes/equipment<br>Two benefits 2x1 | **[2]** | **Do not accept** *environmentally friendly* ; biodegradable<br><br>**Accept**: two correct answers on one line |

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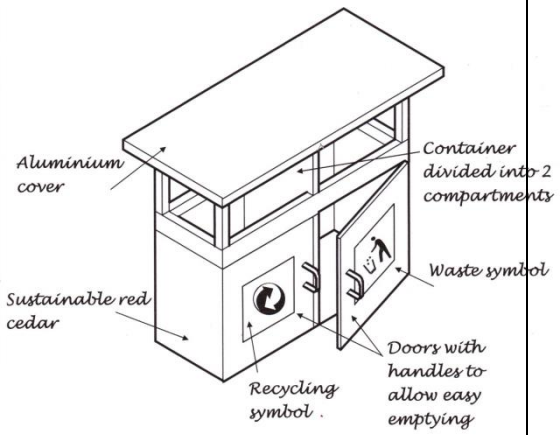
| | **(d)** | | Plastic is made from crude oil (1) this is a finite resource (1)<br>Plastic is not biodegradable/take years to decay (1) and will sit in a landfill site for many years/would take **many** years to break down (1)<br>The type of plastic is hard to identify (1) will be hard to sort for recycling (1)<br>The processing of raw materials needed for plastic uses lots of energy (1) greenhouse gases are released (1)<br>Disposal leads to waste of resources (1) it would be more efficient to reuse a washable container (1)<br><br>Any correct reason (1) + Explanation of the point made(1) | **[2]** | **Do not accept:**<br>Damages the environment -TV<br><br>Two points without any explanation of either = 1 mark max |
| | **(e)** | | Two or more compartments (1)<br>Identification by imprinted or engraved signage (1)<br>At least one **named** appropriate* sustainable/recyclable material (1)<br>Ease of emptying : e.g. removable cover OR addition of doors (1)<br><br>Sketch shows an expected response:<br><br>Sketches indicate a deviation from a "cuboid" shape (as Fig. 1) – 3 marks max<br>Sketches but no notes – 3 marks max<br>Notes but no sketches – 3 marks max<br><br>* Any named softwood, treated mild steel, aluminium , bamboo<br><br>**Do not award**: Stainless steel cover; tropical hardwood container | **[4]** |  |

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| | **(f)*** | | Answers may concentrate upon the disadvantages of waste, consumer expenditure or the advantages of economic growth, jobs etc. Some points which may arise could be:<br><br>• Use of raw materials<br>• Use of energy in processing/transportation<br>• Disassembly for repair/recycling often impossible<br>• More disposal of materials<br>• Additional pressure (from advertising) for consumer spending<br>• Having expense of replacing product or parts<br>• Competitive ownership – "keeping up with the Jones"<br>• Cheaper materials/components/products – more accessible to low income families<br>• New products regarded as fashion/status symbols<br>• Increased wealth from sales<br>• Cheap labour will be employed to make the finished product, which will help lifestyle of inhabitants of LEDCs<br><br>1. READ the full response and judge this in terms of the Level of response (1, 2 or 3).<br>2. THEN consider the quality of the discussion within that level to determine the final mark.<br>3. IT IS POSSIBLE that the initial assessment of level will have to be modified if the content is poor or non-existent; e.g. if the candidate has written a good set of arguments (possible Level 3), but they relate to fashion not obsolescence (max. Level 1)<br><br>Bullet points/lists do not constitute a discussion, and can only be awarded Level 1 (max. 2 marks) | **[6]** | **Level 3 (5-6 marks)**<br>In-depth discussion showing good under-standing of social **and** environmental implications. Good emphasis on aspects of raw materials conservation and waste. Social benefits or disadvantages will be discussed. Specialist terms will be used appropriately and correctly. Answers will be clear and presented in a structured format. The candidate will demonstrate the accurate use of grammar, punctuation and spelling<br>**Level 2 (3-4 marks)**<br>Adequate discussion showing understanding of social **and/or** environmental implications. Emphasis will be found on aspects of raw materials conservation or waste, and social benefits<br>or pressures. There will be some use of specialist terms. Answers will be clear and presented in a mainly structured format. There will be occasional errors of grammar, punctuation and spelling.<br>**Level 1 (1-2 marks)**<br>Basic discussion showing little under-standing of social or environmental implications. Discussion centres upon pollution/greenhouse gas, with little reference to built in obsolescence. There will be little or no use of specialist terms. Answers will be ambiguous and disorganised and there will be intrusive errors of spelling, grammar and punctuation.<br>**0 marks** |

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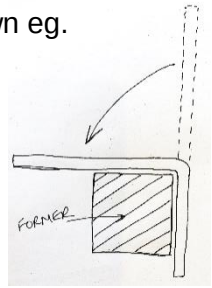
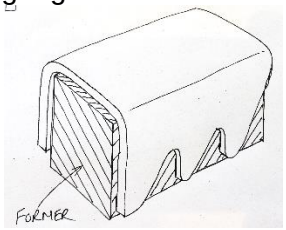
| | | | | | **Discussion wholly outside the topic**, not worthy of a mark |
| | | | **Total** | **[20]** | |
| | | | **Total for this Section** | **[35]** | |

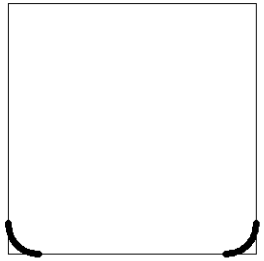
| Question | | | Answer / Indicative Content | Mark | Guidance |
|---|---|---|---|---|---|
| 17 | a | | ductile, malleable, tough, good tensile strength, easy to weld compared to other metals, relatively inexpensive compared to other metals. | 1 | **Do not accept** answers such as 'strong', 'durable", "cheap" |
| | b | | <u>Cutting the bar to length:</u><br>Hacksaw, junior hacksaw, angle grinder, mechanical hacksaw, bandsaw (with metal blade)<br><br><u>Smoothing the edges:</u><br>File, emery cloth (silicone carbide)/paper.wet and dry paper<br><br><u>Marking the pivot hole position:</u><br>Scriber, marker pen/felt-tip pen, centre/dot punch, rule, try square, engineer's blue, **odd-leg/one-leg** calliper<br><br><u>Making the pivot hole:</u><br>Pillar drill, hand/machine vice,clamp, hand drill, drill bit, twist drill | 1<br><br>1<br><br>1<br><br>1 | **Accept**: oxyacetylene torch, plasma cutter.<br><br>**Do not accept:** calliper alone<br>**Accept**: Scribe' for scriber;<br><br>**Do not accept**: drill on own |
| | c | | Brazing, soldering | 1 | |
| | d | i | To improve the appearance, to prevent /slow down rusting, protection from weather | 1 | **Do not accept**: to protect it (TV) |
| | d | ii | Wear ppe/face mask, spray in well ventilated area, use a fume extraction system, do not spray near naked flame. | 1 | e.g. Do not accept: goggles, apron, mask (unless qualified) |
| | d | iii | Powder/plastic/dip coating, stove enamelling, (electro-)plating, galvanising | 1 | Do not accept: oiling, waxing, spraying, varnish |

| Question | | | Answer / Indicative Content | Mark | Guidance |
|---|---|---|---|---|---|
| 17 | e | | **<u>One-off production</u>**<br>Advantages:<br>• One product is made at a time so unique, high quality products are made.<br>• The product is mostly based on the requirements of the customer.<br>• Workers are often more motivated and take pride in their work.<br>• Products may be made by hand or a combination of hand and machine methods<br>Disadvantages:<br>• Very labour intensive, so selling prices are usually higher.<br>• Often highly skilled labour is required<br>• Production can take a long time and can be expensive, for instance if special materials or tools are required.<br>• Economies of scale are not possible, often resulting in a more expensive product<br><br>**<u>Mass production</u>**<br>Advantages:<br>• Production is often continuous (24/7)<br>• Able to meet high demand<br>• Labour costs are usually lower.<br>• Materials can be purchased in large quantities, so they are often cheaper.<br>• Large number of goods are produced.<br>Disadvantages:<br>• Machinery is very expensive to buy, so production lines are very expensive to set up.<br>• Workers are not very motivated, since their work is very repetitive.<br>• Not very flexible, as a production line is difficult to | **6** | **Level 3 (5-6 marks)**<br>In-depth discussion showing good under-standing of the advantages and disadvantages of one-off and mass production methods. Specialist terms will be used appropriately and correctly. Answers will be clear and presented in a structured format. The candidate will demonstrate the accurate use of grammar, punctuation and spelling<br><br>**Level 2 (3-4 marks)**<br>Adequate discussion showing understanding of one off **and/or** mass production methods. There will be some discussion of the advantages and/or disadvantages of either method.<br>There will be some use of specialist terms. Answers will be clear and presented in a mainly structured format. There will be occasional errors of grammar, punctuation and spelling.<br><br>**Level 1 (1-2 marks)**<br>Basic discussion showing little under-standing of one off **or** mass production methods with little reference to advantages or disadvantages. There will be little or no use of specialist terms. Answers will be ambiguous and disorganised and there will be intrusive errors of spelling, grammar and punctuation.<br><br>**0 marks**<br>**Discussion wholly outside the topic**, not worthy of a mark |

| Question | | | Answer / Indicative Content | Mark | Guidance |
|---|---|---|---|---|---|
| | | | adapt.<br>• If one part of the line breaks, the whole production process will have to stop until it is repaired | | |
| **18** | **a** | | Dovetail/comb/finger Joint | **1** | **Do not accept:** dowel, biscuit or butt joint |
| | **b** | | PVA, polyurethane, synthetic resin, Cascamite, Aerolite, Gorilla Glue, | **1** | **Do not accept**: PVC, hot glue, wood glue, glue, Superglue, Unibond, Evo-Stik etc. |
| | **c** | | Accept any *suitable* hardwood.<br>Most likely answers will be: Oak, Ash, Beech, Maple, Elm, Cherry, Teak, Mahogany, Walnut. | **1** | Do not accept: balsa, any softwood, plywood. MDF |
| | **d** | | Forstner bit | **1** | This is the only correct answer |
| | **e** | | Name of an appropriate tool, e.g coping saw, jig-saw, mallet and chisel, router, Dremel, bow saw, pad saw, keyhole saw , file(1)<br><br>Cutting out waste (1)<br><br>Shape/smooth/sand edges with abrasive paper/file/Surform (1) | **3** | |
| | **f** | **i** | MDF, blockboard, chipboard, fibreboard, hardboard, sterling board, OSB, laminboard | **1** | |
| | | **ii** | Supplied in large sheet sizes, less prone to warping, strong in both directions, less likely to split when nailing, consistent strength across board, strong relative to weight | **1** | **Do not accept** answers relating to cost, environmental factors or weight; flexible; hard; durable; easier to work with; ‘stronger’/ ”strong” on its own. |

| Question | | | Answer / Indicative Content | Mark | Guidance |
|---|---|---|---|---|---|
| 18 | g | | Feature that holds cup(s) and/or plate(s) securely in place. e.g. indents/holes in the tray, lips, dividers or other kind of holder. (1)<br><br>Tray will be easy to clean. e.g. a specific material such as acrylic, described as easily cleaned or feature that makes it easy to rinse off/wash (1)<br><br>Tray is easy to carry e.g. large easy grip handles, rubber grips, light(weight) materials so easy to carry (1).<br><br>Safety feature e.g. rounded corners or edges, (1)<br><br>Workable details of appropriate* materials and/or construction details (2).<br><br>***Do not accept** MDF/chipboard in any form | **6** | **Do not accept**: "light" without qualification |

| Question | | | Answer / Indicative Content | Mark | Guidance |
|---|---|---|---|---|---|
| 19 | a | i | **Computer Aided** *Design* | 1 | Both Computer and Aided must be correct for 1 mark |
| | | ii | Mirror | 1 | Tick placed in Mirror |
| | b | | Laser Cutter, milling machine, router | 1 | **Do not accept:** vinyl cutters (e.g. Stika). Marker may have to Google trade names |
| | c | | Any two from:<br>More accurate/consistent, precise, repetitive, cleaner cut, no need to polish edges after cutting, less likely to snap acrylic.<br>Award 1 mark for each advantage | 2 | **Do not accept:** references to designing/measuring in CAD (question is about *cutting*); speed of cutting |
| | d | | 1. Line bender / strip heater – correctly named (1)<br>2. Show/state acrylic being heated ON line bender (1)<br>3. Show use of a workable jig, template/try square or former to make the first bend (1)<br>4. Repeat stages 2 and 3 (1)<br>5. Safety precautions i.e. gloves; hands/clothing/flammable items away **from element** (1)<br>Points can be in sketch or note form | 5 | **Do not accept:** references to marking out (question is about *bending* acrylic)<br>A jig of some sort is shown eg.<br>  <br>Award 1 marks for clearly showing how both corners will be formed correctly using a former/block/jig. eg.<br>  |

| Question | | | Answer / Indicative Content | Mark | Guidance |
|---|---|---|---|---|---|
| 19 | e | i |  | 1 | **Accept:** Another shape drawn inside the given square – assume the candidate has regarded the square as an area in which the answer is to be drawn |
| | | ii | **Accept:** correct processes for the response in e(i), even if this response is incorrect<br>Place in vice/clamp (1)<br>Round off edges using a file (1)<br>Refine edges with wet and dry/emery cloth(1)<br>Accept any two correct points | 2 | **Do not accept**: disc sander, scroll saw, "Hegner"<br>**Do not accept**: glass/sand/abrasive paper |
| | f | | Tensol/acrylic/solvent cement/acrylic solvent, cyanoacrylate (accept superglue), chloroform | 1 | **Do not accept**: epoxy resin, contact adhesive, hot glue |
| | g | | Polyamide (Nylon), Polypropylene, Polystyrene, Low density polythene (LDPE), High density polythene (HDPE), polythene, HIPS, PVC, ABS | 1 | **Accept** almost any thermoplastic; acronyms<br>**Do not accept**: polymorph |

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