

# **Design and Technology: Resistant Materials**

General Certificate of Secondary Education

Unit **A562**: Sustainable Design

## **Mark Scheme for June 2013**

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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.

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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.**

**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.

**BOD** can be used if required.

**Do not** to use **x**

**Do not** to use **?**

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	Benefit of doubt	Use as appropriate
	Caret	Caret sign to show omission	Use when a partial answer is given
	L1	Level 1	Use in banded markscheme responses only
	L2	Level 2	Use in banded markscheme responses only
	L3	Level 3	Use in banded markscheme responses only
	REP	Repeat	Use when additional but is restating the same point
	SEEN	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

Question		Answer	Marks	Guidance
1		(a) Product needs less material in its manufacture	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
2		(d) Take account of the values of society	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
3		(c) Planned obsolescence	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
4		(a) Carbon Footprint	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
5		(c) Assist in designing a similar product that may be more eco-friendly	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
6		British Standards Institute (must be BOTH British AND Standards) 'British Standards' on its own.	1	
7		Kite; kite mark	1	<b>Do not accept:</b> references to health or safety; BSI; British Standards; BSI symbol; symbol of quality
8		Biodegradable, Biodegradability	1	<b>Do not accept:</b> rot; eco-friendly; degradable
9		Thermosetting (the GROUP is required, not a specific plastic) Thermoset	1	<b>Do not accept:</b> thermo(forming) plastic or a named thermoplastic (e.g acrylic)
10		SMA; shape memory alloy; shape memory polymer; Polymorph; thermochromic; polychromic; piezo-electric; nitinol; autoheal; black light pigment; cold-formed plastic; ecofilm; electro-luminescent wire; Faraday film; hydrochromic paint; "silly putty"; smart grease; smart wire	1	<b>Do not accept:</b> nano technology; carbon fibre; Kevlar, GRP, other fibre-reinforced fabrics/plastics If unsure do an internet search for the named material. Do not accept 'memory foam'.

Question		Answer	Marks	Guidance
11		True	1	No mark awarded if both true and false answers ticked, or the candidate response is not clear.
12		True	1	No mark awarded if both true and false answers ticked, or the candidate response is not clear.
13		False	1	No mark awarded if both true and false answers ticked, or the candidate response is not clear.
14		False	1	No mark awarded if both true and false answers ticked, or the candidate response is not clear.
15		False	1	No mark awarded if both true and false answers ticked, or the candidate response is not clear.
		<b>Total</b>	<b>15</b>	

Question		Answer	Marks	Guidance
16	(a)	<p><b>Features:</b>            Few/two materials in its make-up            Easy to disassemble            Cast iron/brass easy to melt down            Not complicated            No plastics/batteries/paint/electronics</p> <p><b>Justifications:</b>  <b>so</b> quick to separate for recycling  <b>so</b> less energy used to melt cast iron or brass  <b>so</b> they are quick to recycle  <b>so</b> makes them easier to separate for recycling  <b>as</b> electrical components are difficult to recycle</p> <p style="text-align: right;">2 x 2</p>	4	<p>Look for <b>one</b> feature and <b>one</b> appropriate justification for two marks.</p> <p>The same justification can be used for two different features</p> <p>Example:            'Type A doesn't use batteries (1) so it doesn't have to be taken to a specific area to be recycled (1)'</p>
	(b)	(i) <p><b>Definition (1 mark):</b>            Does its job well/ how well it works            Only does one job (one function only)            Meets the design specification            Does what it's supposed to do            Fulfils its purpose            Fit for purpose</p> <p style="text-align: right;">1 mark</p> <p><b>Explanations (2 x 1 mark):</b>            Holds/pours ingredients safely            Weighs/Measures            Accuracy</p> <p style="text-align: right;">2 x 1</p>	3	<p>Must relate to the function of weighing, and must refer to any of the scales</p> <p><b>Do not accept:</b>            Easy to use            Easy to move around            Description of how the scales work</p>
		(ii) <p><b>Definition (1 mark):</b>            How the product interacts with the user's senses            The <b>design</b> of a product makes it easy to use</p> <p style="text-align: right;">1 mark</p> <p><b>Explanations (2 examples):</b>            Comfortable to use by most cooks/chefs            Made to suit peoples' hands when using the scales            Weight of food can be easily read/seen            Made to match peoples' hands/eyes            Big screen so easy to read            Easy to use/easy to move around</p> <p style="text-align: right;">2 x 1</p>	3	<p>Must relate to ease of use and can refer to any of the scales</p> <p><b>Do not accept:</b>            Anthropometric            Environmentally friendly            'with the user in mind' – Too Vague</p>

Question		Answer	Marks	Guidance
	(c)	(i)		
		<p><b>Bowl</b> changed from copper through s/steel to plastic            Shape changed from dish to bowl            Addition of spout and handle            Modern bowl is lighter            Size            Weight</p>	1	<p><b>Do not accept:</b> references to the <b>scales</b> – answers must relate only to the <b>bowl</b> (shape or material).</p>
		(ii)		
		<p>Technological advancement            Material changed for lightness            Ease of cleaning            Material changed to eliminate painting/polishing            Shape changed from dish to bowl to make it easier to mix ingredients            Bowl developed to avoid having to transfer ingredients to mixing bowl            Easier/quicker to use/read            Availability of plastics/molding techniques            Use of accurate digital/electronic systems            Plastics easier to mass produce            Market pull/consumer push            More accuracy            Plastic not available in the past</p>	2 x 1 2	<p><b>This is a WHY, not a HOW question</b></p> <p><b>Do not accept:</b>            References to cost            References to batch production            Comfortable – Too Vague</p> <p>Accept references to the bowls <b>or</b> the scales</p>
	(d)	<p>More wastage of materials (trimming)            Material has to be pre-formed into sheets before vac forming (more energy needed)            Heat/energy/power needed to soften plastic</p>	2 x 1 2	<p>This is about the disadvantages of vacuum forming, not about the use of plastic, or the difficulty of recycling the scale, or the energy needed to make the plastic – fossil fuels would be used for ANY plastics manufacturing or forming technique.</p> <p><b>Do not accept:</b> uses machinery (unless qualified by reference to use of power); gives off gases into atmosphere; plastic cannot be recycled after forming</p>
		<b>Total</b>	<b>15</b>	

Question		Answer	Marks	Guidance
17	(a)	Padding to seat/edges of “cockpit”/arm rests Taller back Side supports/handles Foot rests Hand brake/brake mechanism Larger wheels Softer/wider tyres Safety belt Round off corners/edges Steering mechanism Mudguards	3 x 1 3	<b>Notes but no sketch</b> <b>Sketch but no notes</b> 2 marks maximum Notes must provide more information than the sketch shows  This is not a question about technical aspects of D&T; we can't penalise candidates if the steering wheel is not connected to the front wheels or the footrests are floating above the front axle.
	(b)	Softwood more likely to be thrown out for recycling/more available Sustained forests/is sustainable/ grows fast (within a generation) Softwoods need less energy to cut down Softwoods cause less environmental damage when felled Deforestation of tropical hardwood forests threatens wildlife Two related points 2 x 1	2	<b>Accept:</b> references to hardwood IF they imply a comparison with softwoods; <b>Do not accept:</b> Biodegradable More softwood around Eco-friendly (TV) Light/cheap/durable Recyclable References to CO <sup>2</sup> absorption
	(c)	Disassemble for reuse/heating Break down kart into component parts & separated Timber can be reused for garden planters and other garden “furniture”/toys Nuts/bolts can be saved for other projects Wheels set aside for re-use Other items to be crushed before landfill (take to council waste disposal sites)/metal scrap melted down Timber to be shredded/chipped Chips used for industrial heating or briquettes or wood burning stove or playground surfaces or gardening Rubber tyres to be shredded for specialized burning/heating plants Tyres shredded & used for road/path/playground surfacing. Flip flops. Mats. Belts etc.	4	<b>This is about disposing of, not primary recycling, the “end-of-life” kart</b>  <b>Do not accept:</b> Leave wood to rot naturally/landfill Recycle it (TV) General statements about recycling or reusing to make something else(without example) Give the whole go kart to someone else References to use in manufactured boards

Question	Answer	Marks	Guidance
17 (d)*	<p>Look first at which <b>level – 1, 2 or 3</b> (basic, adequate, good) is the best fit for the candidates' response, then use the information on general/specific points to fine tune the mark.</p> <p><b>Level 1 (0–2 marks)</b>  <b>Basic discussion</b>, showing <b>little understanding</b> of using recycled or reclaimed materials. There will be little or no use of specialist terms, ambiguous and disorganised answers; errors of grammar, punctuation and spelling may be intrusive.  Responses which present ideas only as simplistic bullet points cannot achieve Level 2 (therefore max 2 marks)</p> <p><b>Level 2 (3–4 marks)</b>  <b>Adequate discussion</b>, showing <b>some understanding</b> of using recycled or reclaimed materials (reclaiming, cleaning, disinfection). There will be some use of specialist terms, some structure and format of the answer and occasional errors of grammar, punctuation and spelling.</p> <p><b>Level 3 (5–6 marks)</b>  <b>Good, in-depth discussion</b>, showing <b>clear understanding</b> of using recycled or reclaimed materials (de-nailing, cleaning, disinfection, de-bugging). There will be correct use of specialist terms, competent structure in format of the answer and accurate use of grammar, punctuation and spelling.</p> <p>All five points listed here do not have to be found in the response for Level 3 – these are suggested responses that may be seen</p>	6	<p>Question is about using recycled/reclaimed materials not buying the products made from them. The answer should not be a discussion about the (dis)advantages of recycling (less oil used, de-forestation, etc.)</p> <p>Specific points that may show in answer</p> <p>Reclamation</p> <p>De-nailing</p> <ul style="list-style-type: none"> <li>• Remove all previous fixings before sizing, planing or thickening</li> <li>• Splinters, sharp metal edges.</li> </ul> <p>Cleaning</p> <ul style="list-style-type: none"> <li>• Remove rust, dust, dirt by scrubbing/grit blasting</li> <li>• Treat to remove fungal spores</li> <li>• Colour/aesthetics of differing woods</li> <li>• Possibility of lead-based paints.</li> </ul> <p>Disinfection</p> <ul style="list-style-type: none"> <li>• Treat to remove bacteria</li> <li>• Bleach/toxic chemicals.</li> </ul> <p>De-bugging</p> <ul style="list-style-type: none"> <li>• Toxic chemicals to remove woodworm, beetle.</li> </ul> <p>Quality</p> <ul style="list-style-type: none"> <li>• Reclaimed materials cannot be quality assured and could affect quality of finished item</li> <li>• Range of uses therefore more limited than using virgin materials</li> <li>• Possibility of handling stolen goods</li> </ul> <p>Reuse</p> <ul style="list-style-type: none"> <li>• Possible weak material (unknown plastic/metal sources)</li> <li>• Possible use of incorrect or inappropriate plastic.</li> <li>• Size of materials to be reused</li> </ul> <p>Do not accept: references to cost of any/all of the above – we have no way of knowing how much recycling costs.</p>
	<b>Total</b>	<b>15</b>	

Question			Answer	Marks	Guidance
18	(a)	(i)	Stainless steel Bronze/brass Aluminium alloy Nylon  A relevant point	1	<b>Do not accept:</b> plastic (TV); aluminium (too soft); (mild) steel; iron
	(b)		Look for: Möbius Loop (triangular or circular shape with 3 arrow heads) Reference to relevant code number (1 – 7) Written name of plastic that corresponds to code number  Three points 3 x 1	3	<b>Accept:</b> a recognisable attempt at the triangular loop symbol Notes must <b>clarify</b> the sketch <b>Do not accept:</b> labels  1(PET/PETE), 2(HDPE), 3(PVC), 4(LDPE), 5(PP), 6(PS), 7(other)
	(c)	(i)	Conformité Européenne European Conformity	1	<b>Ignore:</b> (lack of) accents <b>Do not accept:</b> European Standards/Regulations Central Europe Certified European European Community
		(ii)	The mark tells/informs/shows the user (means) that:  1 mark  <ul style="list-style-type: none"> <li>• Assessed for conformity/conforms to EU (trading) legislation</li> <li>• Product may be legally sold in EU</li> <li>• Complies with/meets EU safety, health or environmental protection requirements</li> <li>• Product can be traced back to its source</li> <li>• Consumer can be confident the product conforms to relevant requirements</li> <li>• Product is safe to use</li> <li>• Meets safety standard/regulation</li> <li>• Has been checked against EU legislation</li> </ul> 1 mark	2	The first mark can only be awarded if the second part is correct  <b>Do not accept:</b> Made in EU Product has <i>passed</i> European standards/tests  CE marking is a key indicator of a product's <b>compliance</b> with EU legislation  A manufacturer is declaring conformity with all of the legal requirements to achieve CE marking and therefore ensuring validity for that product to be sold throughout the EEA  The product is assessed before being placed on the market

Question	Answer	Marks	Guidance
(d)	<p><i>Repair</i> Mend product when it breaks Replace fixings if lost or broken (nuts and bolts) Check edges for damage such as sharp corners and smooth down with suitable tool</p> <p><i>Redundant</i> Users have become too big to use the slide Users have grown out of/bored with the toy Users have got other toys which hold their interest longer Some components are unnecessary, or the design is unnecessarily complicated Slide packed away for the winter and not needed in the garden</p> <p style="text-align: right;">One qualified point from each heading (2 x 2)</p>	4	<p><b>Accept:</b> <i>Repair</i> synonymous terms Look for a specific repair – ‘replace bolts’</p> <p><i>Redundant</i> <b>Do not accept:</b> references to the slide breaking or being unsafe to use – this is not redundancy Reference to use of too much energy – we don’t know this Slide has been superseded by a more fashionable product References to obsolescence – being out-of-date is not the same thing as redundancy</p>
(e)	<p>Transport as many items as you can/at same time/use larger vehicles, so less fuel needed Disassemble items after manufacture, assemble at point of sale Reduce the packaging to reduce volume Taking large loads and delivering to a number of stores rather than separate journeys to each store Design shapes that can be nested Products can be re-designed to use lighter components Flat packing products to enable more on the lorry</p>	4	<p>This is a question about WHEN large goods are transported to the consumer, not about saving energy IF goods have to be transported to the consumer</p> <p><b>Do not accept:</b> use bio-fuel (still uses energy) move the factory resource locally/store items locally (still needs to be transported to the consumer) use more efficient fuel</p>
	<b>Total</b>	<b>15</b>	

**OCR (Oxford Cambridge and RSA Examinations)**  
**1 Hills Road**  
**Cambridge**  
**CB1 2EU**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998

Facsimile: 01223 552627

Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

**[www.ocr.org.uk](http://www.ocr.org.uk)**

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**OCR (Oxford Cambridge and RSA Examinations)**  
**Head office**  
**Telephone: 01223 552552**  
**Facsimile: 01223 552553**

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