



**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 2015**

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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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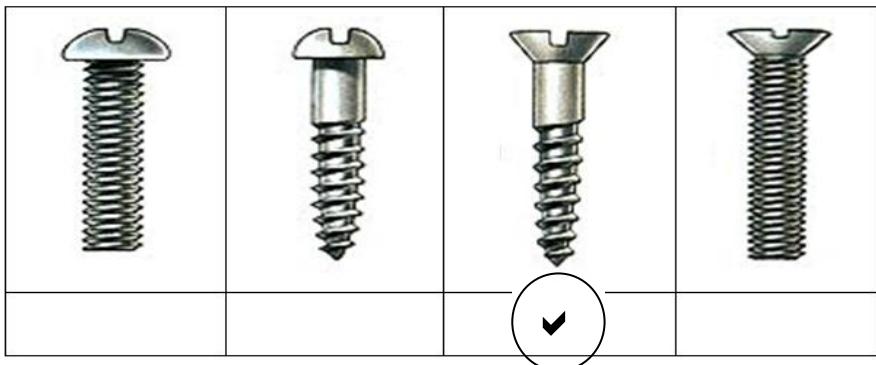
Question		Expected Answers	Marks	Rationale
1		(b) Pine	[1]	No other response is acceptable or possible
2		(c) Geothermal	[1]	No other response is acceptable or possible
3		(d) User	[1]	No other response is acceptable or possible
4		(a) Raw material extraction	[1]	No other response is acceptable or possible
5		(b) Softwood	[1]	No other response is acceptable or possible
6		Recycling/recyclable/recycle symbol	[1]	No other response is acceptable or possible
7		Rethink	[1]	No other response is acceptable or possible
8		Health Safety	[1]	Both words must be present for award
9		Carbon footprint/eco(logical) footprint	[1]	No other response is acceptable or possible. Carbon emissions/dioxide or pollution are not acceptable, as they do not <b>measure</b> anything
10		Globalisation	[1]	No other response is acceptable or possible <b>Do not accept:</b> global
11		False	[1]	No other response is acceptable or possible
12		True	[1]	No other response is acceptable or possible
13		True	[1]	No other response is acceptable or possible
14		False	[1]	No other response is acceptable or possible
15		False	[1]	No other response is acceptable or possible
		<b>Total</b>	<b>[15]</b>	

Question		Expected Answers	Marks	Rationale
16	(a)	<ul style="list-style-type: none"> <li>• Reuses scrap/old components(1) which would take energy to recycle/melt down(1)</li> <li>• Reuses scrap components(1) so new resources needed(1)</li> <li>• Clock mechanism does not use batteries/electrical power(1), so batteries not discarded(1)</li> <li>• Components not specifically made for the clock(1), thus saving time and energy(1)</li> <li>• Uses up bits of bike left over after upgrading(1) so they don't go to waste/landfill(1)</li> <li>• Uses very little energy to make(1) and even less when working(1)</li> <li>• Needs few bought components(1) which use little energy to make(1)</li> </ul> <p>Two reasons + explanations for each 2 x 2</p>	[4]	<p><b>Do not accept:</b> references to cost, recycling (unless qualified), doesn't give off harmful gases, components being re-used</p> <p><b>Accept:</b> same clock feature but different justifications for 4 marks</p>
	(b)	<p><i>Secondary recycling</i> Reuses waste/scrap/unwanted bits from one product for a <b>different</b> purpose (1), for example the clock uses parts of a bike for the face, etc.(1),</p> <p><i>Maintenance</i> Doing what is necessary to ensure the clock continues to work properly/accurately(1) for example lubricating mechanism/ changing battery/cleaning/setting time.(1)</p> <p><i>Life cycle analysis</i> Assesses environmental aspects and potential impact associated with a product's life from cradle to grave(1), referencing ANY stage of LCA of the clock/bike (1) e.g. bike parts are reused rather than scrapped or reprocessed so saving energy/materials.</p> <p>Three definitions + reference to the clock 3 x 2</p>	[6]	<p>e.g. <i>the parts from a bicycle have been taken apart and have been put back together differently(1) to make a new product – the clock (1)</i></p> <p><b>Do not accept:</b> references to repairing / fixing clock (a 6R)</p> <p><b>Do not accept</b> references to longevity of device.</p>

Question	Expected Answers	Marks	Rationale
(c)	<p>1. Does it hold the clock in position(1)      2. Is it stable(1)      3. Does it match the theme – does it contain reused/recycled/sustainable materials(1) (no need to look for fixings)      4. Freestanding (allows pendulum to swing) (1)</p> <p>Picture shows part of a typical response      Sketches but no notes – 3 marks max      Notes but no sketches – 3 marks max</p>	[4]	 <p><b>Do not accept:</b> alternative methods of hanging clock from wall</p>

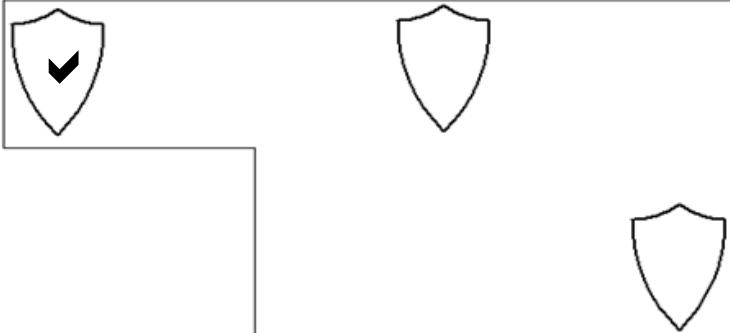
Question		Expected Answers	Marks	Rationale
(d)	<p>This question is about <i>packaging and transporting completed products, NOT about kits, flat-packs, self-assembly, energy of manufacture, or general pollution from transportation. Do not accept any discussion point UNLESS referenced specifically to the assembled product(s)</i></p> <p>Answers may concentrate upon the advantages of buying completed items or the negative aspects of transporting large volumes of packaging and air. Some points which may arise could be:</p> <ul style="list-style-type: none"> <li>• Product needs more packaging/cushioning than a kit would need</li> <li>• Packages will probably be bigger than a kit would need, so will take up more space in any transport vehicle</li> <li>• Large packages more wasteful when disposed of</li> <li>• Large packages tend to be stronger, so may be able to be re-used</li> <li>• Vehicles will need to be bigger to transport the same number of completed products as kit products</li> <li>• Larger vehicles weigh more than small ones, even when carrying lightweight items, so use more fuel</li> <li>• Labour will be employed to make the finished product, which will help lifestyle of inhabitants of LEDCs</li> <li>• Product more likely to be made correctly, so less waste for the consumer</li> <li>• Product more likely to be complete, so no loss of component parts in transit</li> </ul>	[6]	<b>Level 3 (5-6 marks)</b>	<p>In-depth discussion showing good understanding of packaging and/or transportation issues. Good emphasis on aspects of energy conservation and/or waste. 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</p>
<b>Level 2 (3-4 marks)</b>	<p>Adequate discussion showing understanding of packaging and/or transportation issues. Emphasis will be found on aspects of energy conservation or waste. 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.</p>	[6]	<b>Level 1 (1-2 marks)</b>	<p>Basic discussion showing little understanding of packaging or transportation issues. Little emphasis will be found on aspects of energy conservation or waste. Discussion centres upon pollution/greenhouse gas, without reference to the size of packaging. 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.</p>
<b>0 marks</b>	<p><b>Discussion wholly outside the topic</b>, not worthy of a mark</p>	[6]	<b>Total</b>	[20]
<b>Total for this Section</b>		[35]		

Question		Answer	Mark	Guidance
17	(a)	Accept any of the following: Strong for its thickness/weight, strong in all directions, rigid, durable, long-lasting, hardwearing, heavy, smooth, can be bent to shape, weather/water resistant, tough	1	Do not accept answers relating to cost or environmental issues;; strong unless qualified; flexible; bendy
17	(b)	<p><b>Soaking</b> in (hot) water(1) and then clamp around a former/jig/mould(1)</p> <p><b>Kerf/cut</b> evenly spaced slits or grooves in one side of the wood(1) then clamp onto formed sides/around a former/jig/mould(1)</p> <p><b>Steaming/place</b> wood in a chest filled with steam(1) then clamp around a former/jig/mould(1)</p> <p><b>Laminating/building</b> up thin sheets of plywood (1) then clamp around a former/jig/mould(1)</p> <p>Bend round a mould/clamp/nail/glue/weighting in place = 1 mark only Each process: name + description = 1 + 1</p>	2	<b>Do not accept:</b> dry heat
	(ii)	Mild/stainless steel, aluminium; GRP, carbon fibre	1	<b>Do not accept:</b> "steel" on its own
17	(c)	Anthropometric – (average) size of people's hands/arm length/height of hand above the ground(1) used to determine height of the hole(1) so you don't need to <b>bend</b> down too far(1) used to determine size of the hole(1) so your carrying hand will <b>fit</b> in the hole(1) Data (1) + reason (1)	2	<b>Do not accept:</b> any reference to other body parts
17	(d)	(i) Lap/rebate/rabbet/half lap  (ii) $9 \pm 1$ (mm)	1	<b>Do not accept:</b> (half) butt
	(ii)	$9 \pm 1$ (mm)	1	Don't need "mm" for the mark

Question		Answer				Mark	Guidance
	(e) (i)					1	This is the only correct answer
	(ii)	Less likely to rust/will not rust/will last longer/durable; non-corrodible/(non-corrosive BOD); aesthetics; does not mark wood				1	<b>Do not accept:</b> strong, unless qualified; <b>Accept:</b> stronger (comparison is implied in the question)
	(f)	<b>Marking the hole position:</b> pencil /steel ruler/ tri square/tape measure/marketing gauge/bradawl <b>Making the pilot hole:</b> pillar/hand/electric/cordless drill, drill bit <b>Closing / tightening the joint:</b> screwdriver, carpenters brace & bit, cordless driver			1 1 1		
17	(g)	Nanotechnology			1	This is the only correct answer	
			<b>Total</b>	<b>15</b>			

Question			Answer	Mark	Guidance								
18	(a)	(i)	Washer / plain washer	1	This is the only correct answer.								
18		(ii)	Butterfly nut / Wingnut	1	This is the only correct answer.								
18	(b)		So that it can be adjusted/tightened up by hand/fingers/without use of a spanner	1	<b>Do not accept:</b> easier/quicker/better grip								
18	(c)		<table border="1"> <thead> <tr> <th>Process</th> <th>Tool / item of equipment</th> </tr> </thead> <tbody> <tr> <td>Cutting out the shape</td> <td>Hacksaw / junior hacksaw / shears / guillotine / jig saw / abrafile</td> </tr> <tr> <td>Smoothing the edges</td> <td>File</td> </tr> <tr> <td>Bending into shape</td> <td>Vice / metal folder / bending irons / folding bars / press (mould) / jig / hammer /mallet / former / anvil / clamp</td> </tr> </tbody> </table>	Process	Tool / item of equipment	Cutting out the shape	Hacksaw / junior hacksaw / shears / guillotine / jig saw / abrafile	Smoothing the edges	File	Bending into shape	Vice / metal folder / bending irons / folding bars / press (mould) / jig / hammer /mallet / former / anvil / clamp	1 1 1	<p><b>Do not accept:</b> laser cutter, bandsaw, coping saw</p> <p><b>Do not accept:</b>, grinder, abrasive papers, emery cloth, sander</p>
Process	Tool / item of equipment												
Cutting out the shape	Hacksaw / junior hacksaw / shears / guillotine / jig saw / abrafile												
Smoothing the edges	File												
Bending into shape	Vice / metal folder / bending irons / folding bars / press (mould) / jig / hammer /mallet / former / anvil / clamp												
	(d)		Mark out position of the hole Drill hole Saw/chisel out corners of round hole File inside the hole  Any three steps 3 x 1	3	<b>Accept:</b> steps out of sequence <b>Do not accept:</b> wood cutting saw (tenon/panel/ coping/dovetail ...)/sandpaper								

Question	Answer	Marks	Guidance
18 (e*)	<p>Key points to be explained:</p> <p>Advantages of CAM/CNC:</p> <ul style="list-style-type: none"> <li>• Increased accuracy of finished product</li> <li>• Can produce lots of identical products in quantity</li> <li>• Quicker to manufacture</li> <li>• No workshop skills needed</li> <li>• Modifications can be made easily</li> </ul> <p>Disadvantages:</p> <ul style="list-style-type: none"> <li>• Machinery and equipment needed is expensive to purchase.</li> <li>• Can be difficult to program correctly</li> <li>• Specialist staff needed to use equipment</li> <li>• More room needed to house the equipment</li> <li>• Need power to run (cannot work in powercut)</li> </ul> <ol style="list-style-type: none"> <li>1. READ the full response and judge this in terms of the LEVEL of response (1, 2 or 3).</li> <li>2. THEN consider the quality of the “technical” content within that level to determine the final mark.</li> <li>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 recycling not reusing (max. Level 1)</li> </ol> <p>Bullet points/lists do not constitute a discussion, and can only be awarded Level 1 (max. 2 marks)</p>	6	<p><b>Level 3 (5-6 marks)</b> Thorough discussion, showing clear understanding of the advantages and disadvantages of using CAM/CNC compared to traditional hand methods. Can provide clear examples of issues with examples. Specialist terms 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><b>Level 2 (3-4 marks)</b> Adequate discussion, showing an understanding of some of the advantages and disadvantages of using CAM/CNC compared to traditional hand methods. Can provide a reasonable discussion of the issues with some examples. There will be some use of specialist terms, although these may not always be used appropriately. The information presented will be for the most part in a structured format. There may be occasional errors in spelling, grammar and punctuation.</p> <p><b>Level 1 (1-2 marks)</b> Basic discussion, showing some understanding of the advantages and disadvantages of using CAM/CNC compared to traditional hand methods. Can provide a limited discussion of some of the issues. There will be little or no use of specialist terms. Answers may be ambiguous or disorganised or ‘list like’. Errors of grammar, punctuation and spelling may be intrusive.</p> <p><b>0 marks</b> No response worthy of credit</p>
	<p><b>Total</b></p>	<b>15</b>	

Question		Answer	Marks	Guidance
19	(a)		1	This is the only correct answer
	(b)	Tensol cement, Superglue, Araldite, (liquid) solvent cement, contact/impact adhesive, epoxy resin, acrylic cement	1	Award 1 mark for any of the answers opposite. <b>Do not accept</b> hot glue gun, PVA, double-sided tape, plastic glue/cement, solvent
	(c)	Modification/additions to the bottom of the acrylic upstand OR top of base (1)  Additional method of fixing upstand to base/support to receive bottom edge of upstand (1) e.g. dowels/pegs/screws/epoxy resin  Annotations giving additional details of tools/equipment/fixings/sizes (1)	3	e.g. tenon on end of upstand OR mortice in base  <b>Do not accept:</b> nails/pins
	(d) i	Router, (disk/detail) sander, sanding machine, milling machine, bandsaw, belt/band sander, linisher	1	
	ii	Plane, file, sand/glass paper, chisel	1	<b>Do not accept:</b> saw

Question		Answer	Marks	Guidance
	(e)	Rub/sand down surface with medium abrasive paper Rub/sand down surface with fine/wet and dry abrasive paper until smooth Clean surface/ wipe off dust, dirt Apply sanding sealer/dilute PVA Apply a primer  Any two relevant points	2	Abrasive paper: glass/sand paper; flour paper; garnet paper; wet and dry
19	(f)	a) Does it hold six trophies (need indication of size or proportions or drawing of 6 trophies for this mark)  b) Is it wall mountable (mirror plates or screw holes through back, keyhole plate or other <b>practical</b> method)  c) Does it have a clear indication of a <b>working</b> lock  d) Does it allow trophies to be viewed from at least 2 sides  e) Are there details of materials AND/OR details of methods of construction <b>other than</b> glass/clear plastic used in (d) above, e.g. hinges  Award one mark for each correct response x 6	6	<b>Do not accept:</b> details of wall fixing (nails/ raw plug).  Clear and <b>effective</b> method of locking the cabinet.  Glass/acrylic on at least 2 sides.  Up to 2 marks for the details of materials and methods of construction given.  *
		<b>Total</b>	<b>15</b>	
		<b>Total for this section</b>	<b>45</b>	
		<b>Total for paper</b>	<b>80</b>	

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