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 2016

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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.

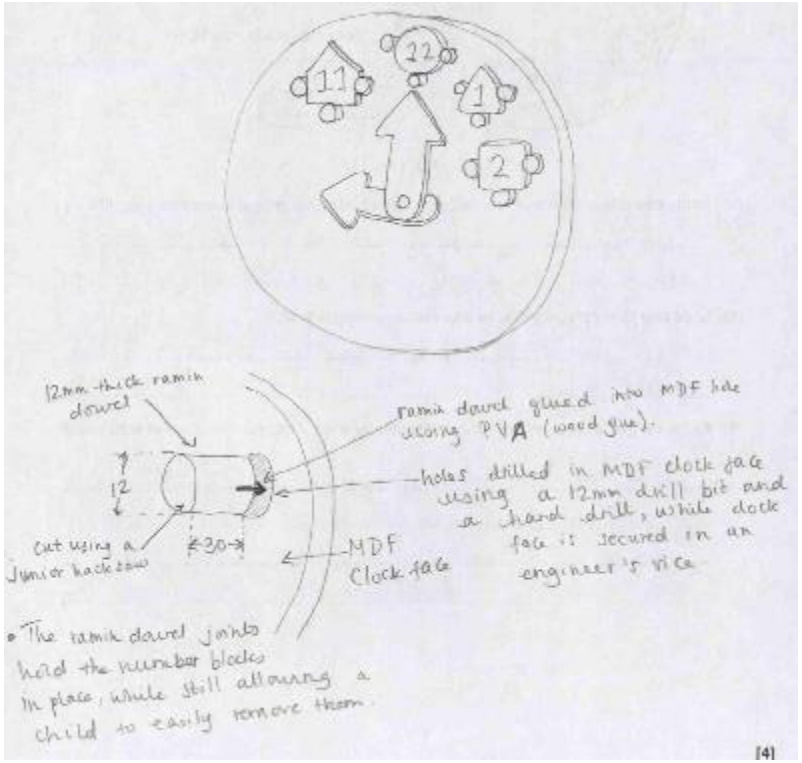
Banded mark scheme questions to show **L1, L2** or, **L3 only** – do not use ticks.
Where a **list or bullet points** have been used to answer the Banded Mark Scheme question a **maximum mark of 2** is to be given.

BOD	BOD	Benefit of doubt	Use as appropriate
L1	L1	Level 1	Use in banded mark scheme responses only
L2	L2	Level 2	Use in banded mark scheme responses only
L3	L3	Level 3	Use in banded mark scheme responses 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

Question			Answer	Marks	Guidance
1			(b) Disassembly	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
2			(a) Product design	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) Flying splinters, sparks and dust	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
4			(d) Producers receive a reasonable price for their goods	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) Dangerous for the environment	1	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
6			Carbon(s)	1	Do not credit any other answer.
7			Reuse	1	**Do not accept:** any other of the 6Rs, or any other answer
8			Footprint	1	Do not credit any other answer.
9			Landfill	1	Do not credit any other answer.
10			Hazards/dangers/Health & Safety (issues)/health risk	1	**Do not accept**: risk on its own.
11			False	1	No mark awarded if both true and false answers ticked, or the candidate response is not clear.
12			False	1	No mark awarded if both true and false answers ticked, or the candidate response is not clear.

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

Question			Answer	Marks	Guidance
16	(a)		Age of user/age range Colours that appeal to target group Size of user's hands/grip size/mouth User's capability of recognising shapes (may be age-dependent) User's capability of recognising complexity (may be age-dependant) Size of pieces that could be swallowed/choked upon How/when children learn One relevant point	1	**Do not accept:** references to recycling; references to testing/sizing of component parts (comes after making); references to small parts/sharp edges/safety (evaluation); references to product analysis; age (unqualified and too vague); make sure toy is suitable for child (evaluation) anthropometric(s) (TV)
	(b)		Dust is reduced to low limits (vacuum) (Dust/face) mask to be worn Goggles to be worn One relevant point	1	Do not accept: references to PPE (except dust mask/goggles); dust/face mask/goggles on their own; statements of the obvious, e.g.MDF is dusty, or MDF splits or MDF has sharp edges
	(c)		Pieces are small/cannot be reused ... Paint coatings more difficult to recycle ... Acrylic/Plastic/hands are not biodegradable ... Multiple materials ... Difficult to dispose of ... ... so needs to be sorted before disposal to landfill ... so incineration will produce toxic fumes ... so uses non-renewable resources One point + relevant explanation 1 + 1	2	***Two separate points but no explanation = 1 mark only.*** Do not accept: references to toxicity of components (it's a child's toy); references to parts falling off due to wear and tear; "it cannot be recycled" without qualification; "It's made with acrylic and MDF" without qualification
	(d)		Question asks for a modification that still allows shapes to be ***bedded into a recess***. Look for a practical idea of: Magnets/Velcro in recess (1) AND magnet/Velcro on back of block (1) "Bayonet" fitting of block in recess (push (1) and twist (1) Pegs in recess (1) AND holes in back of block (1) Shelf under each block (1) to give extra support (1)		**Sketches only or notes only = 3 points maximum** Notes must elaborate upon the seen drawing (must add more information than can be seen) **Do not accept:** *descriptive* written notes/written labels; deeper recesses; fixed pins protruding from block but no corresponding locking groove; nuts and bolts

Question			Answer	Marks	Guidance
			Hinged/fixed stand (1) to maintain back-sloping face (1) that's stable (1) Spring clip in side of recess (1) Sketch or notes clearly describing protrusion to grip block (1) *Explanatory* note (1)	4	 If idea is impractical, as above, **accept only**: Sketch or notes clearly describing protrusion to grip block (1) *Explanatory* note (1)
	(e)		Look for three separate and different points, for example: Taller/larger blocks (within reason) Larger hands (within reason) Make toy larger (within reason) Place handles on top of each block Make tops of blocks easier to grip/textured surface		**Do not accept:** references to colour (question relates to *manual* skills); transporting clock; references to computerised alternatives; references to strength of materials; references to weight; references to LED indicators/audio output/Braille

Question			Answer	Marks	Guidance
			Stand to hold clock face at angle Make blocks from foam to make them easier to grip String/elastic to attach blocks to clock face Make recesses bigger Three points 3 x 1	3	
	(f)		No sharp edges/no splinters/smooth faces/curved edges Curved arrow heads Construction is robust Correct finish is used (non-toxic) No loose components (magnets, steel plates, pegs, etc.) No large gaps between hands and face (of the clock) Blocks large enough not to choke/no small pieces Three points 3 x 1	3	**Do not accept:** comments that relate to evaluation tests; more than one reference to "sharp edges" or "splinters" or "rounded edges"; light/lightweight
	(g*)		Look first at which **level – 1, 2 or 3** (basic, adequate, good) is the best fit for the candidates' response, then use the information on general/specific points to fine tune the mark. **Level 3 (5–6 marks)** **Good, in-depth discussion**, showing **clear understanding** of the impact of globalisation upon manufacturers and/or consumers. There will be correct use of specialist terms, competent structure in format of the answer and accurate use of grammar, punctuation and spelling. **Level 2 (3–4 marks)** **Adequate discussion**, showing **some understanding** of the impact of globalisation upon manufacturers and/or consumers. There will be some use of specialist terms, some structure and format of the answer and occasional errors of grammar, punctuation and spelling.		Question is about the impact of globalisation, either upon the ***manufacturer*** where the product is manufactured, or upon the ***consumer*** where the product is sold. Generalised discussion or any environmental issues are not relevant here. In this context; manufacturer is the manufacturing company, ***not the individual artisans***. Ethical aspects are also irrelevant, as are references to "3rd world". Specific points that may show in answer **Advantages**: • Resources of different countries are used for producing goods and services they are able to do most efficiently. • Consumers get much wider variety of products to choose from. • Consumers get the product they want at more competitive prices. • Companies are able to get necessary goods and services at most competitive prices.

Question			Answer	Marks	Guidance
			Level 1 (1–2 marks) **Basic discussion**, showing **little understanding** of the impact of globalisation upon manufacturers and/or consumers. 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) **0 marks** Discussion wholly outside the topic, not worthy of a mark All the points listed here do not have to be found in the response for Level 3 – these are suggested responses that may be seen	6	• Companies get access to much wider markets • Promotes understanding and goodwill among different countries. • Businesses and investors get much wider opportunities for investment and/or profit **Disadvantages** • Developed countries can prevent development of undeveloped and under-developed countries. • Economic depression in one country can trigger adverse reaction across the globe. • Companies face much greater competition. This can put smaller companies, at a disadvantage as they do not have resources to compete at global scale. • Availability of item or repair parts • Additional costs of shipping packaging
			Total for Q16	**20**	

Question			Answer	Marks	Guidance
17	(a)		Platinum, Palladium, Silver, Gold, Copper, Titanium, Aluminium, Pewter, Brass, tin, bronze, gilding metal	1	**Do not accept**: iron or any ferrous alloy (including stainless steel)
	(b)		*Reason:* Non corrodible/Does not corrode/unreactive … Shiny/aesthetic … Can be highly polished … Can be made in different colours (gold in particular) … Appealing colours/can be anodised … Precious metal … Lightweight … Malleable/Easy to bend … Lighter than other metals (only if 17a is "aluminium") … Durable/lasts a long time … *Explanations for its use* … so looks expensive … so looks attractive/aesthetically pleasing … so hard-wearing ... so comfortable to wear/not heavy to wear … so can be easily shaped (One description + one explanation) = (1+1) x 2	4	Ensure responses correspond to the candidate's answer in 17a, even if 17a is incorrect. E.g. Stainless Steel (17a) is incorrect (0). Looks shiny (1) is a correct property of stainless steel **Do not accept:** references to cost except "looks expensive" Non-corrosive Does not oxidise Does not get scratched Light/Strong unless justified Two separate points but no explanation = 2 marks only Two separate points but repeated explanation = 3 marks only
	(c)	i	Any figure from 0.5mm (25 SWG) to 2mm (14 SWG) thick	1	**Do not accept:** less than 0.5mm or greater than 2mm
		ii	Either: Circumference/size of wrist…/circumference around knuckles… or Circumference/size of ankle…/circumference around heel… Plus: … so that the bracelet fits. 1+1	2	**Must have** the specific anthropometric description PLUS reference to "fit" of the bracelet to a person

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td></td><td>(d)</td><td></td><td>
<table>
<tr><td>Process</td><td>Tool(s) required</td></tr>
<tr><td>Cutting metal sheet to size</td><td>Guillotine/tin snips/(junior) hacksaw/metal shears/”Hegner” saw</td></tr>
<tr><td>Form holes in sheet metal</td><td>Hand drill/drill bit/pillar drill/drill/needle file/(half)round file/conical reamer/punch/wheel brace/miller</td></tr>
<tr><td>Smooth cut edges</td><td>File/wet n dry paper/emery cloth (various grits)/buffing mop(machine)/grinder/ disc sander</td></tr>
</table>
3 x 1 mark
</td><td>3</td><td>Do not accept:

saw/band saw; metal cutters (TV)

Files other than (half)round file/Forstner bit/rasp/hole saw

sandpaper/glasspaper/file;</td></tr>
<tr><td></td><td>(e)</td><td></td><td>Look for:
Hardwood or steel former/beak of anvil/cylindrical former (1)

Hammer/mallet/hand force on aluminium (1)

Former held in clamp/secure end of strip in soft-jawed vice/clamp (1)

Use of a correct written technical term (1), e.g. mandrel, ball-pein hammer, hide mallet, over-bending

OR</td><td>4</td><td>Sketches only or notes only = 3 points maximum
Notes must elaborate upon the seen drawing (must add more information than can be seen).

Do not accept: written “notes” which are just labels;
Strip heater to bend metal = 0 marks;
heat metal to bend it = 0 marks;
bending metal without use of mandrel = 0 marks</td></tr>
</table>

Question			Answer	Marks	Guidance
			Bench-mounted rolling machine shown (1) a) adjust roller gap (1) b) feed in metal/turn handle (1) c) repeat rolling/remove rolled cylinder from rollers (1) Any point sketched and/or noted 4 x 1		
			Total for Q17	**15**	

Question			Answer	Marks	Guidance
18	(a)		Rigid/stiff/structurally strong Easy to stick/join together Aesthetic/looks nice/self-finished Easy to clean One point	1	**Do not accept:** references to vacuum forming (usually polystyrene); references to heating/shaping (not relevant here); references to impact resistance/durability/chemical resistance/scratch resistance; Light/strong unless qualified
	(b)		Can see if size/shape are adequate for purpose (1) … before final design is confirmed (1) Can use cheap materials (1) … before committing to plastic (1) Can model in scale size (1) … to reduce material content (1) Will highlight deficiencies in design (1) … and make cheap changes if necessary (1) Finalised model speeds up production process (1) … keeping costs down/profits up (1) Look at aesthetics of the piece (1) Can make sure components fit (1) Make sure phone and accessories fit (1) (One description + one relevant explanation) = (1+1)x2	4	**Do not accept:** can see if it takes the weight; can see if it's durable
	(c)		**Mark out:** Try square/engineer's square; "Chinagraph" pencil; permanent marker pen; scriber; steel rule; CAD (e.g. 2D design) **Cut:** Laser/hacksaw/coping saw/fretsaw/"Hegner" saw/ scroll saw/band saw/, CAM **Finish**: File/wet n dry/polish/buffing mop(machine)	4	**Sketches only or notes only = 3 points maximum** Notes must elaborate upon the seen drawing (must add more information than can be seen) Look for: Possible "egg-box" design Square ends Soft-faced holding tools Fine-toothed saws/files

Question			Answer	Marks	Guidance
			Adhesive: Acrylic adhesive, glue or cement (“Tensol”)/ epoxy(araldite)		Fine abrasives/polishes Named adhesives (Tensol, Araldite) **Do not accept:** written “notes” which are just labels Do not accept: pencil; marker pen; felt pen; screw fixing
	(d*)		Look first at which **level – 1, 2 or 3** (basic, adequate, good) is the best fit for the candidates’ response, then use the information on general/specific points to fine tune the mark. **Level 3 (5–6 marks)** Thorough explanation, showing clear understanding of the benefits of using CAD compared to by hand. Can provide clear examples of issues with examples. There will be correct use of specialist terms, competent structure in format of the answer and accurate use of grammar, punctuation and spelling. **Level 2 (3–4 marks)** Adequate discussion, showing an understanding of the benefits of using CAD compared to by hand. Can provide a reasonable discussion of the issues with some examples. There will be some use of specialist terms, some structure and format of the answer and occasional errors of grammar, punctuation and spelling. **Level 1 (1–2 marks)** Basic discussion, showing some understanding of the benefits of using CAD compared to by hand . Can provide a limited discussion of some of the issues. 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) **0 marks** Discussion wholly outside the topic, not worthy of a mark		Question is about the **benefits** of CAD software, in comparison with traditional pen/pencil and paper… Discussion of the disadvantages of CAD or the advantages of hand drawing are irrelevant, as are references to CAM. Specific points that may show in answer: CAD • Uses less materials such as paper • Easier to make changes and modifications • Mistakes can be rectified easily • Easier to store the design • Copies can be made easily and at less cost • Easier and quicker to share electronically • Takes up less physical space • Less prone to damage • CAD can be downloaded directly to CAM • Free/cheap software Paper • Paper drawings may warp • Paper drawings are susceptible to damp • Paper sketches are quick but difficult to interpret • Paper drawings cannot show off differing views • Doesn’t need computer

Question			Answer	Marks	Guidance
			All the points listed here do not have to be found in the response for Level 3 – these are suggested responses that may be seen	6	
			Total for Q18	**15**	

Question			Answer	Marks	Guidance
19	(a)		Suitable named hardwood – Oak, Ash, Cherry, Beech, Elm, Mahogany, Birch, Teak	1	**Do not accept**: pine/fir, balsa, yew, laburnum
	(b)		*Benefit*: Uses stable substrate (base) … Base can be large width and length … Boards easier to work/cut … Base not limited to standard plank widths … Uses rare woods in a sustainable/environmental way … Uses less oak than solid oak … *Explanation* … so less chance of warping/twisting … so product can be used in a more decorative room … so wide boards can be made and used … so fewer joints seen … as it is less dense … so rare timbers can be managed better as more is made from each tree … so outcome is still aesthetically pleasing (One benefit + one explanation) = (1+1)x2	4	**Do not accept:** Cheap/strong/light unless qualified
	(c)		**1. Mark positions of holes** Mark centre line of cut end 9.5mm from face Mark centres of 2-3 holes along centre line Drill suitable holes at marked points, Ø6-8mm Insert centre-point tool into holes Mark line across top of side, 9.5mm down from top edge Line up top with side and tap side to mark hole centres		Consecutive steps ***must*** commence with (1) and ***end*** with (4), with any two other intermediate stages ***Must specify type of glue*** **Do not accept:** mark out (given in question)

Question			Answer	Marks	Guidance
			Drill holes to suitable depth (less then 18mm deep) Mark length of dowel Tenon saw to cut dowels to length Insert dowels into side holes Dry-fit joint **4. Apply *PVA/wood* glue to protruding dowels and assemble/tap top in place** 4 separate steps	4	
	(d)	**i**	Door stay/flap stay/lid stay/stay	1	**Do not accept:** any other answers
		ii	Response showing where the stay is to be used to restrain the lid/flap: One end to back of door Other end to inside of cupboard 1+1	2	**Do not accept:** description showing the stay being used as a hinge or support bracket Accept: On the door at the top of the unit (1)
	(e)		Base too narrow for height Base sticks out, causing tripping hazard Base easily damaged Cupboard too high Door knob too shallow Sharp edges/corners No castors/cannot be moved for cleaning No catch on door (might fall open) 1+1	2	**Do not accept:** aesthetics; won't fit in the space
	(f)		(Yacht) varnish/polyurethane/(bees)wax/Danish oil/ lacquer/(French) polish Any clear, drying finish	1	**Do not accept:** gloss
			Total for Q19	**15**	

Question			Answer	Marks	Guidance
			Total for Q1-15	**15**	
			Total for Q16	**20**	
			Total for Q17	**15**	
			Total for Q18	**15**	
			Total for Q19	**15**	
			Total for Question Paper	**80**	

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