

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 2014

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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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Annotations

Annotation	Meaning
BP	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
Green tick	Use for all correct answers to show where marks are awarded
L1, L2, L3	Use to show the level of response in 16f and 18e
BOD	Can be used (sparingly).

Subject-specific Marking Instructions

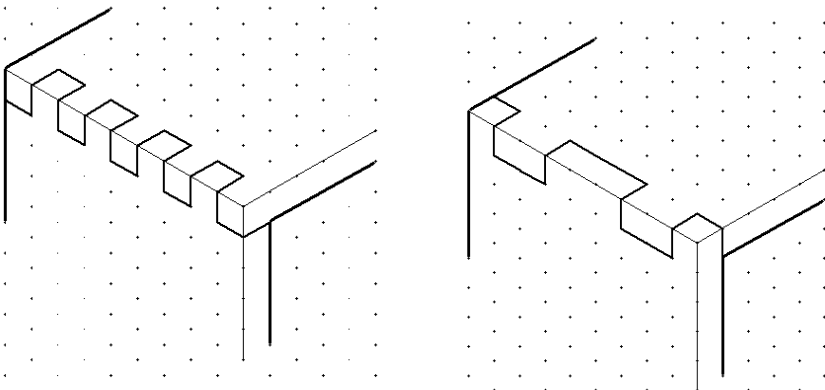
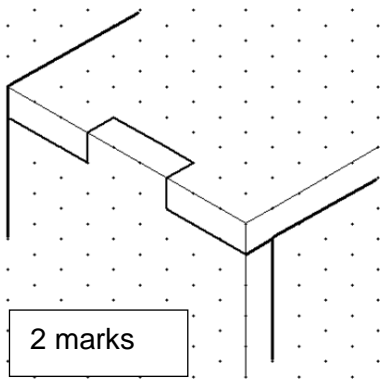
Answers relating to dimensions/sizes must be in metric units.

Question	Expected Answers	Marks	Rationale
1	(a) Coal mine	[1]	No other response is acceptable or possible
2	(b) Rethink	[1]	No other response is acceptable or possible
3	(c) Looks	[1]	No other response is acceptable or possible
4	(d) Lasts for a fixed period of time	[1]	No other response is acceptable or possible
5	(a) Have to be assembled at home	[1]	No other response is acceptable or possible
6	Glass recycle/glass recycling/glass bottle recycling/glass to be recycled	[1]	Do not accept: recycled/ breakable, glass (unqualified), litter, recycling bottles.
7	Nano technology/nano materials/nano; smart technology/smart materials/smart	[1]	Do not accept: advanced technology
8	Management/managing	[1]	Do not accept: maintenance/maintaining
9	Rights	[1]	No other response is acceptable or possible
10	Culture / cultural; ethnic; ideology; heritage	[1]	Do not accept: society, ethics, ethnicity, ethical
11	False	[1]	No other response is acceptable or possible
12	False	[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
Total		[15]	

16	(a)	(High Density) polythene (HDPE); Low Density polythene (LDPE); polystyrene; acrylic/Perspex/plexiglass; PVC; HIPS (high impact polystyrene), ABS, Nylon, Vinyl	[1]	Do not accept: thermoplastic/thermosetting plastic (too vague), epoxy resin, polypropylene.
	(b)	Does not splinter/break into sharp pieces when bent Does not break into small pieces Look for reference to small/tiny/many pieces.	[1]	Do not accept: unbreakable; can be bent/folded, not brittle, won't break if dropped, doesn't crack, doesn't break easily, shatterproof.
	(c)	Ruler is clear/see through: 1 mark so can check spacing/alignment of underlying ruling/text, so makes measuring easier, divisions on underside of ruler so more accurate when measuring (no parallax) Is more flexible (1 mark only) Explanation 1 mark	[2]	Do not accept: references to cost (economics), size (ergonomics), appearance (aesthetics); shatter resistant (repeat of 16b).
	(d)	Less fuel/energy used/needed for transport of raw materials Less fuel/energy used/required to get workers to place of employment Less fuel used reduces costs/ Reduces carbon footprint/saves natural resources Less pollution/CO ₂ /greenhouse gas emissions from transportation vehicles Improves local economy More chances of employment for local people Better education/facilities/quality of life for local people Two points plus linked explanation (2 x 1) + 1 One point with two explanations 1 + 2	[3]	Do not accept: references to selling products locally, taking products back for repair, less impact on environment (TV). No explanation – only two marks possible.

	(e)	<p>Freedom to choose employment or leave employment Freedom to join trades union Safer environmental /unpolluted environment/working conditions/work place Safe equipment (machinery) No child/forced labour Living/fair/better/minimum wage Reasonable/better working hours No discrimination Regular employment Regular breaks Humane treatment/workers treated fairly Hygienic conditions/clean water</p> <p style="text-align: right;">Four points 4 x 1</p>	[4]	<p>Do not accept: any reference to H&S equipment, e.g. tools, protective clothing, PPE; reference to “basic human rights” (TV) references to sick pay, holiday pay.</p> <p>Do not accept: ‘comfortable conditions’</p> <p>Do not accept: references to temperature of the working environment.</p>
	(f)	<p>Notches/teeth on one edge to indicate measurements; Start/stop notches Ribbing/ridges/engraving Large/bold numbers Braille/raised dots Slider to set measurement Magnifying convex shape Contrasting colours (one reference only) Spoken numbers when activated Thicker/wider/bigger ruler to make it easier to locate in the desk Strap to fasten ruler to user's wrist ... makes it easy to find</p> <p style="text-align: right;">Three points 3 x 1</p>	[3]	<p>Adaptations may indicate a tactile OR magnifying quality.</p> <p>A drawing of a ruler is not, in itself, sufficient for a mark.</p> <p>The question is about visually, not physically impaired people.</p>

<p>(g) *</p>	<p>Answers ought to concentrate upon one or more of the following aspects of raw material extraction/use, by-products of plastics manufacture or plastics disposal:</p> <ul style="list-style-type: none"> • oil/gas needed for production, depriving us of energy • impact of continued extraction of scarce fossil fuels • plastics release of CO₂/methane when broken down, adding to greenhouse effect/global warming • plastics need careful sorting before being recycled • plastics thrown onto landfill take a long time to degrade <p>Answers may concentrate upon just one or two of the above aspects, or may jump from one to another. Best response will be broken down into 3 or 4 paragraphs, three majoring on one topic each, and one conclusion; not all topics need be covered.</p> <ol style="list-style-type: none"> 1. READ the full response and judge this in terms of the LEVEL of response (1, 2 or 3). 2. THEN consider the quality of the “technical” content within that level to determine the final mark. 3. IT IS POSSIBLE that the initial assessment of level will have to be modified if the technical content is poor or non-existent; e.g. if the candidate has written a good set of arguments relating to use of plastics (possible Level 3), but has not focused upon the topic in question. 4. Bullet points do not constitute a discussion, and can only be awarded Level 1 <p>(max. 2 marks)</p>	<p>Level 3 (5-6 marks) Sound discussion showing understanding of the place of plastics in today’s society. Knowledge of raw material extraction. More than one specific example given and referred to. Specialist terms will be used appropriately and correctly. Answers clear and presented in a structured format. Accurate use of grammar, punctuation and spelling.</p> <p>Level 2 (3-4 marks) Adequate discussion showing some understanding of how plastics are used today. Some knowledge of raw material extraction. Just one specific example given. Answers clear and presented in a mainly structured format. Occasional errors of grammar, punctuation and spelling.</p> <p>Level 1 (1-2 marks) Basic discussion showing little understanding of how plastics are used today. Little or no knowledge of raw material extraction. No specific examples given. Little or no use of specialist terms. Answers ambiguous and disorganised; intrusive errors of spelling, grammar and punctuation.</p> <p>0 marks Discussion wholly outside the topic, not worthy of a mark.</p>
	<p>Total Total for this Section</p>	<p>[6] [20] [35]</p>

Question		Answer	Mark	Guidance
17	(a) (i)	Any hardwood such as oak, mahogany, beech, teak, cherry, ash, pear, etc.	1	Do not accept balsa..
	(ii)	Any answer from the following: <ul style="list-style-type: none"> Looks attractive / attractive grain pattern / looks good when oiled or varnished / aesthetically pleasing Durable / long lasting / tough / impact resistant Heavy/dense so good sound qualities / will not move around 	1	Do not accept: references to cost; strong/cheap/economical/hard unless qualified eg. stronger than softwood; waterproof; scratch resistant. Can achieve mark even if there is incorrect / no response to 17(a)i
	(b)	<p>Finger joint drawn in any configuration/spacing</p>  <ul style="list-style-type: none"> A minimum of 5 'fingers' on top and side positioned correctly (interlock) as shown Fingers equal and correct size (1 space – equal to thickness of interlocking wood) Fingers equally / symmetrically space <p style="text-align: right;">3 x 1 relevant points</p>	3	<p>Joint must be drawn on the corner as shown.</p> <p>If less than 5 fingers – maximum 2 marks (see below)</p> 

Question	Answer	Mark	Guidance
(c) (i)	Hole cutter/drill, flat (wood) bit, combination hole saw, forstner bit, auger bit, spade bit, taper shank twist drill, centre bit with screw nose, sawtooth bit. Tank cutter, Trappaning tool, Expansive bit	1	<p>Do not accept: key-hole or other saw-like tools; drill bit (TV); 28mm; 2.8cm; circle cutter (for card or paper)</p> <p>Accept: correct drawing described by the word “drill”</p>
	<p>(ii) Question asks about cutting the hole, NOT marking it out.</p> <p>Hand tools:</p> <ol style="list-style-type: none"> 1. Centre punch/Bradawl 2. Clamp panel or hold in vice 3. Drill hole(s) inside the marked circle 4. Insert jigsaw / coping saw/ hegner saw / pad saw blade and cut out hole 5. Smooth edges / neaten up shape with a file 6. Tidy up edges of hole with abrasive paper <p>Power tools:</p> <ol style="list-style-type: none"> 1. Locate centre for drilling 2. Clamp panel 3. Drill with large diameter saw tooth/Forstner bit or electric router 4. Use sacrificial bed when drilling 5. Smooth edges with glasspaper <p>Laser cutter/CNC machine</p> <ol style="list-style-type: none"> 1. Design on named appropriate software (eg 2D Design) 2. Name the machine (laser/router) 3. Load/clamp material 4. Set tool/machine parameters (tool size/depth etc.) 5. Send information to machine 6. Turn on extraction 7. Cut shape <p style="text-align: right;">4 x 1</p>	4	<p>Do not accept: hammer and chisel; hole saw in hand-held drill; cutting board across the diameter of the hole.</p> <p>Award 1 mark for notes or a sketch showing the stage.</p> <p>Accept variations.</p> <p>Notes must elaborate upon the sketch – cannot just be one-word label.</p>

Question		Answer	Mark	Guidance
	(d)	<ul style="list-style-type: none"> • Smoother finish / no brush marks • No lines • More even finish/coverage • Better control of paint/varnish application • No brushes to clean out • No hairs coming off brush 	1	Do not accept: aesthetically pleasing (unless qualified). Quicker/easier is in the question, so is unacceptable, as is quick.
	(e) (i)	Flammable / Inflammable	1	Do not accept: fire hazard.
	(ii)	Wear face mask/respirator/dust mask; use extraction; spray in ventilated area; do not spray near naked flame; spray away from body/eyes.	1	Do not accept: wear gloves/apron/goggles; mask(TV).
	(f)	<p>Non slip material shown that will stop the speakers sliding around e.g. rubber feet held in place with screws (e.g. toilet seat buffers) or rubber matting with suitable adhesive. Show how feet will be fixed to the base of speakers. e.g. screws, self adhesive pads, or a suitable adhesive (cyanoacrylate, epoxy resin etc.)</p> <p style="text-align: right;">2 x 1 mark</p>	2	Do not accept: use of non-slip matting (this does not modify the base of the speaker) Glue (unless qualified) PVA; felt pads; sponge Trade names e.g.Araldite, Superglue Double-sided foam pads.
Total			15	

Question		Answer	Mark	Guidance									
18	(a) i	(High Density) polythene (HDPE); Low Density polythene (LDPE); polystyrene; acrylic/Perspex/plexiglass; PVC; HIPS (high impact polystyrene), ABS, Nylon, Vinyl	1	Do not accept: thermoplastic/thermosetting plastic (too vague), epoxy resin, polypropylene.									
	ii	Any thickness between 3 – 6	1	Assume answer to be in mm if no units are stated. e.g. 4 Accept answer in centimeters, e.g. 0,4cm									
	(b)	Any reference to tolerance being the amount of error or lee-way allowed /acceptable in the size of the product. The maximum and minimum measurements of the size allowed The unwanted but acceptable deviation from a dimension. Reference to size/dimension of product including tolerance Reference to the product still being functional/within specification 2 x 1 marks	2	Do not accept: references to load-bearing capacity; ' ± 1mm' as it's given in the in the question. Do not confuse tolerance of finished dimension with extra allowance made for waste.									
	(c)	<table border="1"> <thead> <tr> <th>Process</th> <th>Tool or Item of equipment</th> <th>Safety precaution</th> </tr> </thead> <tbody> <tr> <td>Polishing the edge of plastic</td> <td>Buffing Machine</td> <td>Wear goggles/wear apron/guards in place/hair tied back/tie tucked in Hold work piece firmly Hold work piece in the direction of the travel of the wheel Only one person using machine</td> </tr> <tr> <td>Bending the plastic to shape</td> <td>Strip heater; line bender; wood former (jig)</td> <td>Wear protective gloves/don't touch the bender or heating element/ don't touch hot surfaces</td> </tr> </tbody> </table> 3 x 1 mark	Process	Tool or Item of equipment	Safety precaution	Polishing the edge of plastic	Buffing Machine	Wear goggles/wear apron/guards in place/hair tied back/tie tucked in Hold work piece firmly Hold work piece in the direction of the travel of the wheel Only one person using machine	Bending the plastic to shape	Strip heater; line bender; wood former (jig)	Wear protective gloves/don't touch the bender or heating element/ don't touch hot surfaces	3	Do not accept: keep fingers away from wheel; clamp down item (impractical) For buffing machine do not accept gloves. Do not accept: oven; heat strip.
Process	Tool or Item of equipment	Safety precaution											
Polishing the edge of plastic	Buffing Machine	Wear goggles/wear apron/guards in place/hair tied back/tie tucked in Hold work piece firmly Hold work piece in the direction of the travel of the wheel Only one person using machine											
Bending the plastic to shape	Strip heater; line bender; wood former (jig)	Wear protective gloves/don't touch the bender or heating element/ don't touch hot surfaces											
	(d)	Plastic has been cut to correct size Edges of plastic are smooth and have no rough edges Corners are rounded off to the correct radii Surface of the plastic has not been cracked or scratched Bends are in the correct place and parallel Bends are in the correct orientation/at the correct angle Temperature is correct before bending Visual check		Do not accept: references to testing for strength, capacity or similar – these relate to evaluation of the finished product. references to equipment safety.									

Question		Answer	Mark	Guidance
		Plastic is correct thickness 2 x 1 point from list	2	
18	(e)	<p>Laptop stand will be angled, with suitable support, towards the user</p> <p>Stand can be hinged/folded to a flat shape</p> <p>Effective air flow/holes in stand for air movement</p> <p>Method that allows it to be carried in one hand</p> <p>(4 x 1)</p> <p>Details of materials: (main material must be a named softwood. A mark may be awarded for naming a material used for other features)</p> <p>1 mark</p> <p>Details of construction: 1 mark</p>	6	<p>Only sketches OR only notes maximum 4 marks.</p> <p>Do not accept: one-word labels on self-evident sketches (notes must elaborate upon what can be seen in the sketch).</p> <p>Accept: electrical components (e.g. cooling fan) if correctly annotated and relevant to the specification.</p> <p>If a hardwood or man made board is named as main material then do not award a mark for materials.</p>
Total			15	

Question		Answer	Mark	Guidance
19	(a)	Lightweight; high strength to weight ratio; durable; does not rust/require rust proofing; looks appealing/attractive; no finish required <p style="text-align: right;">One of these</p>	1	Do not accept: strong, rigid, hardwearing, light unless qualified Do not accept: malleable, ductile Do not accept: answers relating to cost. Answers must relate to the use of aluminium for workshop shelving legs, so properties must relate to this use.
	(b) (i)	MDF; blockboard; plywood; hardboard; fibreboard; particle board; laminboard; OSB; sterlingboard <p style="text-align: right;">Two of these</p>	2	Do not accept: Contiboard.
	(ii)	make it look more appealing/improve aesthetics surface is smoother will not get chipped/damaged/splintered as easily/more durable easy to clean/keep clean protect chipboard from spills of oil/water keep chipboard dry because it is not aesthetically pleasing – refers to bare chipboard <p style="text-align: right;">One of these</p>	1	Do not accept: protect the wood/protection unless qualified (e.g. protects the wood from ...)
	(c) (i)	Cam Lock Fitting /Cam lock/cam and dowel/pin	1	Do not accept: cam (TV); cam & bolt; screw; nut & bolt.
	(ii)	Any screwdriver	1	Do not accept: Torx/Allen/Roberton key/spanner.
	(d)	Will not split the chipboard Easier to put together/take apart for the customer Less tools needed to assemble/disassemble Looks better than a screw head Stronger/joint will last longer More secure/more effective <p style="text-align: right;">2 x 1 point</p>	2	Do not accept: quicker, cheaper unless qualified, 'strong' on its own.
	(e)	Poor quality of the design	1	Do not accept: more than one answer ticked (ZERO mark – see Marking Instructions #5).

Question	Answer	Marks	Guidance
19 (f*)	<p>This question is about making products from manufactured boards rather than from solid timber. Discussion may centre upon boards, but may alternatively focus upon solid timber by way of a counterpoint. ACCEPT environmental arguments.</p> <p>Advantages of boards:</p> <ul style="list-style-type: none"> • Use less virgin materials than real woods • Can be easier to cut, drill, due to lack of grain • Can be bought in large sheets not just planks • Same strength in both directions • Can be coated with plastic/veneer etc • Less prone to warping • Can have unique properties such as flexibly, Kor-Board, etc. • Generally/some man made boards cost less than solid timber. • Often easier to apply a finish to (e.g. paint) <p>Disadvantages of boards:</p> <ul style="list-style-type: none"> • Does not look as attractive. • Not as strong • More prone to splitting • Most are less resistant to moisture • Difficult to join boards <p>Advantages of solid timber (hardwood or softwood)</p> <ul style="list-style-type: none"> • Attractive • Easier to shape by traditional woodworking methods • Very strong along the grain • Can be enhanced with clear coatings <p>Disadvantages of solid timber</p> <ul style="list-style-type: none"> • Prone to warping/twisting • Not easily available in wide planks • Weak across grain <p>Answers may concentrate upon just one or two of the above aspects, or may jump from one to another. Best response will be broken down into 3 or 4 paragraphs, three focusing on one topic each, and one conclusion; not all topics need be covered.</p>	<p>Level 3 (5-6 marks)</p> <p>Level 2 (3-4 marks)</p> <p>Level 1 (1-2 marks)</p> <p>0</p>	<p>Thorough discussion, showing clear understanding of the advantages and disadvantages of using man-made boards compared to real woods. 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>Adequate discussion, showing an understanding of some of the advantages and disadvantages of using man-made boards compared to real woods. 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>Basic discussion, showing some understanding of the advantages and disadvantages of using man-made boards compared to real woods. 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>No response worthy of credit.</p>

		<p>READ the full response and judge this in terms of the LEVEL of response (1, 2 or 3). THEN consider the quality of the “technical” content within that level to determine the final mark. IT IS POSSIBLE that the initial assessment of level will have to be modified if the technical content is poor or non-existent; e.g. if the candidate has written a good set of arguments relating to use of wood (possible Level 3), but has not focused upon the topic in question.</p> <p>Bullet points do not constitute a discussion, and can only be awarded Level 1 (max. 2 marks)</p>			
		Total	15	1	
		Total for this section	45	4	
				5	

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

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

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