

General Certificate of Secondary Education June 2013

Design and Technology: 45601

Resistant Materials Technology

(Specification 4560)

Unit 1: Written Paper

Final



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Sec	tion A		
1	Use the following criteria to mark questions 1 (a), (b) & (c). Award 1 mark for a correct Requirement and 1 mark for a correct Explanation		
	Any three correctly identified requirements.		
	Possible responses: Should be easy to carry Must be soundly constructed Should organise the items Should be capable of being manufactured in quantity Must be capable of being manufactured in quantity Must be safe to use Must be ergonomically designed Must be durable Must be durable Must be compact Must be stable Must be easy to clean Must use environmental friendly materials/ processes Award marks for specific 'Art Deco' features.	3 x 1	
	See 'Art Deco Style' sheet. Do not accept		
	 Information given on Brief Repeat answers 		
	Candidates may place both parts of the answer in the 'Explanation or the 'Requirement'.		
	Any three relevant explanations		
	 Possible responses: Staff will need to pick it up and move it quickly around the cafe/restaurant. The device should not break when in use This will make finding the items easy Making things in bulk reduces the unit cost No one should be injured when using the device It should be easy and comfortable to use It should withstand everyday use It should not take up too much room on the table The device should not topple over The device must be bygienic 		Max 6
	The device must be hygienicSo the environment is not harmed	3 x 1	marks

2	 Mark each idea out of 3 using the following scale: A repeat idea A simple idea in the Art Deco style An idea in the Art Deco style displaying some creativity or with additional design features A creative idea in the Art Deco style 	0 1 2 3 5 x 3	Max 15
		5 x 3 marks	Max 15 marks

Q2 Exemplar answers

1 mark	2 marks	3 marks
A simple idea in the Art Deco style	An idea in the Art Deco style displaying some creativity or with additional design features	A creative idea in the Art Deco style
	5	100 million and 100 million an
3		

3	Development details could include:		
	Materials and finish		
	Award one mark each for details relating to two materials.		
	Or Award two marks for a single material with a justification (Max 2 marks)		
	Award one mark each for details relating to two types of finish		
	Or Award two marks for a single finish with a justification (Max 2 marks)	Max 3	
	Construction		
	 Award up to three marks for constructional details A simple reference to a method of construction A outline of a method of construction Detailed information relating to a method of construction 	1 2 3	
	Design features and sizes		
	Award one mark each for details relating to two design features. (Max 2 marks) Award one mark each for two relevant sizes (Max 2 marks)	Max 3	Max 9 marks

4		Award one mark each for an analytical comment.		
		Comments must be justified to be awarded mark.		
		There are no marks for statements		
		Look for connecting words such as 'therefore, so, because'		
				Max 3
			3 x 1	marks

Se	Section B							
5	(a)		Award one mark for e	ach correctly en	tered cell			
			Plastic (Polymer)	Thermoplastic	Thermosetting plastic			
			Acrylic (PMMA)	✓				
			Urea formaldehyde (UF)		\checkmark			
			Polyvinyl chloride (PVC)	✓				
			Polypropylene (PP)	✓				
			Polyethylene terephthalate (PET)	\checkmark				
			Melamine formaldehyde (MF)		✓			
			Candidates ticking in	both boxes score	e no marks		Max 5 marks	
5	(b)	(i)	Thermoplastic			1		
5	(b)	(ii)	Award one mark each • Can be mould • Easily recycled • Cost effective The explanation must thermoplastic. Do not relating to plastics e.g	ed with the use o d relate to specific award marks for	of heat c properties of a generic comments		Max 2 marks	
5	(c)	(i)	Thermosetting/thermo	set plastic		1		
5	(c)	(ii)	Award one mark each • Does not disto • Rigid • Durable/Hard • Fire resistant/	rt with heat wearing	ing to:			
			The explanation must thermosetting plastic. comments relating to	Do not award m	arks for generic		Max 2 marks	

6	Award marks using the following descriptors:		
	If a candidate has chosen just one part of the lamp they can still gain full marks.		
	Stage 1: Marking out (traditional)		
	Sufficient detail for a part or parts to be marked out by a third party, as a one off . Most tools and equipment given.	1 – 2	
	Tools: pencil, rule, compass		
	Sufficient detail for a part or parts of the design to be marked out by a third party, in quantity , using a template . Most tools and equipment given.	3 – 4	
	Tools: pencil, rule, compass, scissors, card/ply template		
	Or		
	Stage 1: Marking out (CAD)		
	Sufficient detail for a part or parts of the design to be drawn by CAD by a third party. Most tools and equipment given.		
	 Look for details relating to: Computer hardware Drawing on screen Naming software Use of different coloured lines/tool path 	1 – 4	
	Stage 2: Cutting and shaping (traditional)		
	Sufficient detail for a part or parts of the design to be cut and shaped by a third party as a one off . Most tools and equipment given	1 – 2	
	Sufficient detail for most of the design to be cut and shaped by a third party, in quantity, using jigs/templates/power tools . Most tools and equipment given.	3 – 4	
	Tools: Jig/Bandsaw, disc sander, router		
	Or		
	Stage 2: Cutting and shaping (CAM)		
	Sufficient detail for the design to be manufactured by CAM. Most tools and equipment given.		
	 Look for details relating to: Transfer of data to CAM CNC router 		
	Clamping work piece		

Changing toolsSafety	1 – 4	
Answers that relate to use of the Laser cutter can only be awarded 2 marks unless the candidate provides specific details on how the material would be cut out in thin (3mm layers) and then built up. Or, the candidate may have indicated that the cutting would be done using multiple passes.		
Stage 3: Joining		
Limited details of a simple method of joining the stem to the base. Some tools and equipment given.		
 E.g. Gluing Applying glue Clamping 	1 – 2	
Detailed description of a suitable method of joining the stem to the base. Most tools and equipment given.		
 E.g. Screwing Pilot hole Clearance hole Countersink Screw Screwdriver 		
 Dowelling Marking out holes Drilling Applying glue Fitting dowels Clamping 		
 Mortise and tenon Marking out Cutting mortise hole Cutting tenon Applying glue Clamping 		
 Biscuit Marking out Cutting the slot Applying glue Clamping 	1 – 4	
Stage 4: Securing the wires to the switch		
Limited details of a simple method of securing the wires to the switch. Some tools and equipment given.		

		E.g. Twisting the wires onto the terminals	1	
		Detailed description of a suitable method of joining the stem to the base. Most tools and equipment given.		
		 E.g. Soldering Stripping the wires Using a soldering iron Adding solder 		
		 Using spade connectors Stripping the wires Using a spade connector Using a crimping tool 		
		 Small nut, bolt and washer Stripping the wires Using nut, bolt and washer 	1 – 4	Max 16 marks
7	(a)	Wooden chair		
		Award one mark each for correctly identifying a suitable hardwood:	1	
		Possible responses: • Teak • Mahogany • Oak • Ash • Beech		
		Award one mark for giving a suitable reason:	1	
		 Possible responses: Strong Durable This material has natural properties that make it 		
		 Attractive/stylish 	1	
		Award one mark for giving its original source:Tree/forest	1	
		Candidates may be awarded marks for a correct reason even if the		

Candidates may be awarded marks for a correct reason even if the material is wrong.

Metal chair Award one mark each for correctly identifying a suitable metal: Possible responses:

• Aluminium/ stainless steel

	 Steel only if plated (Galvanising/ chrome plating) 	1	
	Award one mark for giving a suitable reason: Possible responses:		
	 Strong Suitable for outdoor use 	1	
	Lightweight Award one mark for giving its original source:		
	BauxiteOre (iron)	1	
	Candidates may be awarded marks for a correct reason even if the material is wrong		Max 6 marks

r				
7	(b)	Look for details relating to the possible environmental impact of using plastics (polymers) to manufacture products:		
		Plastics come from crude oil		
		Crude oil is a non renewable resource		
		 The transportation of oil can be dangerous for the environment 		
		 Non renewable fossil fuels are burnt in the refining of oil into plastic 		
		 Pollution is caused when refining oil into plastic 		
		 Non renewable fossil fuels are used when moulding plastics into products 		
		 Pollution is caused when moulding plastics into products 		
		 The pollution leads to climate change 		
		The pollution causes acid rain		
		Plastic products can be recycled		
		Plastic products are durable		
		 Many plastic products are very slow to degrade 		
		Mark the answer for its technical content and then apply it to the following criteria.		
		 A response which is poorly structured with no relevant examples. There is very little or no use of design technology terminology and with many errors in grammar, punctuation and spelling. 		
		grammar, parlotation and spoining.	0	
		 A response which contains very limited reference to any of the examples above. The answer is vague or poorly attractured with little use of design & technology. 		
		structured, with little use of design & technology		

		 terminology and with a considerable number of errors in grammar, punctuation and spelling. A fairly detailed response which refers to some of the examples above. The answer is fairly well structured, with some use of design & technology terminology and with a small number of errors in grammar, punctuation and spelling. 	1 – 2 3 – 4	
		 A detailed and comprehensive response that includes several of the examples above. The answer is well- structured, with good use of appropriate design & technology terminology and showing a good grasp of grammar, punctuation and spelling. 	5 – 6	
		 A fully detailed and comprehensive response that includes details of most of the examples above. The answer is well-structured, with good use of appropriate design & technology terminology and showing a good grasp of grammar, punctuation and spelling. 	7 – 8	Max 8 marks
8	(a)	Use the following criteria to mark questions 8 (a) (i), (a) (ii),		
		(a) (iii) & (a) (iv)		
		Award one mark for each correctly identified ergonomic feature and 1 mark for each suitable explanation.		
		 Possible responses: The strap Prevents you dropping the torch on the floor if you lose your grip on the handle/can be hooked on a belt 		
		 The handle Has a textured surface to prevent slipping The diameter makes it easy to hold 		
		 The wind up handle Is long enough to make winding easy/folds away after use/has a spinning handle 		
		The operating buttons Are easy to access with your fingers Are coloured to indicate on/off		
		The focussing ring It is serrated for easy grip		
		The balance of weight Making it comfortable to hold		
		 The body Bright colour so it can be easily seen Curved body to fit in the hand 		Max 8 marks

8	(b)	 Award one mark each for an answer that refers to any of the following and up to two marks each for a suitable detailed explanation that provides information relating to how anthropometric data has influenced the design of the wind up torch. Possible responses: Reference to the collection of data Measuring the target market 5th to 95th percentile Standard charts The size of the handle/strap/focussing ring has been 			
			 influenced by the average size of a human adult hand. The sizes of the operating buttons have been influenced by the average size of human adult fingers. 		Max 4 marks
8	(c)	(i)	 Award one mark each for a use for the wind up torch Possible responses: When walking in the dark During a power cut emergency at home When looking for something in the dark Award one mark each for 2 correct reasons. It doesn't need batteries/ power source It is waterproof It is colourful and easy to find Safe It is cost effective It gives a direct beam of light 	1	
8	(c)	(ii)	 Award one mark each for a use for the gas light Possible responses: When fishing When having a BBQ When camping Award one mark each for 2 correct reasons. It gives all round lighting It doesn't need electricity Its self-supporting/ hanging 	1	

9	(a)	Award one mark for naming a 'one off' product and up to		
		three marks for a suitable detailed explanation of the term 'one off' production:		
		Possible products:		
		Wedding ringBespoke furniture		
		 Hand-made musical instrument e.g. guitar, violin 	1	
		Accept non Resistant Materials		
		Possible explanation:		
		 One product is being produced Manufactured by a highly skilled craftsperson 		
		Very expensive	Mar. 0	Max 4
		Labour intensive	Max 3	marks
9	(b)	Award one mark for naming a 'batch' produced' product and up to three marks for a suitable detailed explanation of the term 'batch' production:		
		Possible products:		
		• Cars		
		Mountain bikes		
		 House hold appliances e.g. vacuum cleaner, fridge, cooker. 	1	
		Accept non Resistant Materials		
		Possible explanation:		
		Many similar products are being made		
		Usually for the mass marketManufactured by machines		
		Affordable prices	May 0	Max 4
		Flexible machining options	Max 3	marks
9	(c)	Award one mark for naming a product made by 'continuous' production and up to three marks for a suitable detailed explanation of the term 'continuous' production:		
		Possible products:		
		Plastic bottles		
		Food cans		
		Paper	1	
		Accept non Resistant Materials		
		Possible explanation:		
		One product is being made 24/7 There is a constant demond.		
		There is a constant demandFull automated manufacturing plants		Max 4
		 Very high set up costs 	Max 3	marks

10	(a)) (i)	Award one mar			
			Component	Symbol	Function	
			Switch	0	It switches the circuit on and off (1 mark)	
			Lamp		It converts electrical energy into light (1 mark)	
			Motor	M	It converts electrical energy into rotary motion (1 mark)	
			Speaker		It converts	
			(1 mark) Not bell/buzzer		electrical energy into sound	Max 4 marks
10	(a)	(ii)	Award one marl mark for correct	Max 4 marks		

10	(h)	(i)	Award one mark for	ach correct recer	n n		
10	(b)	(i)	Award one mark for				
			Possible responses				
			Copper is a				
			Copper wire				
			Copper can	easily be soldered			Max 2
			Do not accept chea		marks		
10	(b)	(ii)	Award one mark for				
			Material: PVC/Polyp	propylene/Polyethyle	ene/Rubber	1	
			Award one mark for	a correct reason			
			Possible responses				
			 It is a good i 				
			flexible				
			 can easily be waterproof 				
			 durable does 	1			
					5		
10	(C)		Award one mark for				
			Health and				
			safety issue	Hazard	Precaution		
				You could burn	Keep your fingers		
			The tip of the	your fingers /	away from the tip / make sure you		
			soldering iron	table top	replace it into its		
			gets hot	(1 mark)	device after use.		
					(1 mark)		
					Make sure you are		
				T	in a well-ventilated		
				The fumes could give you	area / make sure you are using		
			Soldering gives	breathing	extraction		
			off fumes	difficulties	equipment/wear a		
				(1 mark)	mask		
					(1 mark)		Max 4
							marks