

# **Design and Technology**

General Certificate of Secondary Education

Unit **A544:** Industrial Technology Technical Aspects of Designing and Making

## **Mark Scheme for January 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

Annotation	Meaning
	Unclear
	Benefit of doubt
	Irrelevant (used for languages)
	Two statements are linked
	Benefit of doubt not given
	Poor diagram
	Repeat
	Noted but no credit given
	Tick
	Too vague
	Cross

Question		Answer	Marks	Guidance
1	(a)	Dividers – drawing circles/curves on metal Centre punch – marking the centre of a hole before drilling Try square – to draw/check right angles on metal Odd-legged (jenny) callipers – drawing lines parallel to an edge  (8x1)	8	
	(b)	Template/pattern	1	
	(c)	Make sure the drill is in tight Clamp work securely/in vice Make sure emergency stop is accessible Wear goggles/visor Wear apron/overalls One person at machine/keep area clear  (3x1)	3	
		<b>Total</b>	<b>12</b>	

Question			Answer	Marks	Guidance
2	(a)		It is easy to cut/drill/bend into shape It is a rigid plastic It is available in a range of colours It is relatively cheap/easy to get  (2x1)	2	Accept individual responses for ease of cutting/drilling/ bending
	(b)		Diagram completed to clearly show (1) acrylic firmly held (1) and supported below hole (1) to prevent splintering.  (3x1)	3	Annotation needed for full marks
	(c)		Soften acrylic for bending      strip/line heater Bend into shape                      bending jig/former Hold while plastic cools      clamps/bending jig  (6x1)	6	Reference to holding required for full marks
	(d)		Transfers/stickers Hand engraver Laser cutter/engraver Sticky-backed plastic (vinyl) Stencil and (spray) paint Permanent marker	1	
			<b>Total</b>	<b>12</b>	

Question		Answer	Marks	Guidance
3	(a)	Lacquer/varnish Anodising/Galvanising Plating Painting/Plastic Coating	1	Allow reference to 'self-finishing' or 'polishing'
	(b)	The thickness of the handle to suit hand size The shape of the handle to be comfortable in use The distance under the handle to allow fingers to go under Length of the handle to suit hand size  One mark for feature; one mark for explanation/justification  (2x2)	4	One mark only for simplistic references to size, shape and 'smoothness'
	(c)	Die casting	1	

Question			Answer	Marks	Guidance	
					Content	Levels of response
	(d)*		Up to six marks for an explanation or critical evaluation of reasons why aluminium is widely used in manufacturing.	6	<p>Explanation may include consideration of the following points:</p> <p>Aluminium alloys are easily recycled after use.</p> <p>Products readily disposed of at 'end of life'.</p> <p>Can be used to produce very lightweight products.</p> <p>Alloys have good strength to weight ratios.</p> <p>Better corrosion resistance than many other metals.</p> <p>Easy to produce shapes by casting/machining.</p> <p>Less energy needed to melt for casting.</p>	<p><b>Level 3 (5–6 marks)</b> Shows clear understanding of the reasons why aluminium alloys are widely used in manufacturing products and gives suitable examples. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.</p> <p><b>Level 2 (3–4 marks)</b> Shows some understanding of the reasons why aluminium alloys are widely used in manufacturing products. There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented 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> Shows only limited understanding of any reasons why aluminium alloys are widely used in manufacturing products. There will be little or no use of specialist terms. Answers may be ambiguous or disorganised. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 = a response not worthy of a mark. Add 'Seen' at end of response</p>
			<b>Total</b>	<b>12</b>		

Question			Answer	Marks	Guidance
4	(a)		Mild steel is: Easy to cut and form Cheaper than most other metals Stronger than many other metals Can accept finishes easily to protect against corrosion Can be recycled  (3x1)	3	
	(b)	(i)	Welding/spot welding Riveting/pop-riveting Brazing  (2x1)	2	Not soldering
		(ii)	Nuts and bolts Self-tapping screws	1	
	(d)		Up to six marks for a clear response covering each of the spec points and with annotation giving details of components/processes.  Stability 0-2 marks Adjustable without tools 0-2 marks Components and processes 0-2 marks  (6x1)	6	Must be a realistic design to qualify for full marks
			<b>Total</b>	<b>12</b>	



Question			Answer	Marks	Guidance
5	(a)		<p>Easy to alter designs without redrawing            Designs can be saved electronically, saving space            Can 'import' features from other sources            Designs can be sent by email            Ability to produce 3D images            Ability to 'rotate' designs to evaluate            Can be used with CAM to produce prototypes</p> <p>(3x1)</p>	3	<p>Accept only reference to the designing stages up to prototyping.</p> <p>Not – 'more accurate'; 'easier'</p>
	(b)	(i)	<p>Examples:            Robot welding/spraying of car bodies            Pick and place assembly of PCBs/toothbrush bristles            Moving parts between machines for machining            AGVs</p>	1	
		(ii)	<p>CNC lathe/milling machine/router/laser cutter/machining centre/vinyl cutter /3D printer</p> <p>(2x1)</p>	2	

Question			Answer	Marks	Guidance	
					Content	Levels of response
	(c)*		Up to six marks for an explanation or critical evaluation of the advantages and disadvantages of using computer controlled machines in manufacturing.	6	<p>Discussion may include consideration of the following points:</p> <p>Some workers may lose their jobs.</p> <p>Safer/cleaner working environment.</p> <p>Some workers may re-train for the higher skilled jobs.</p> <p>Some of the dangerous tasks are done by machines/robots.</p> <p>Products made are more consistent.</p> <p>24/7 working possible.</p> <p>Cost of setting up is high.</p> <p>Training required for workers.</p> <p>Quicker and easier to make changes to products made.</p> <p>Machines can be self-adjusting to maintain accuracy.</p>	<p><b>Level 3 (5–6 marks)</b> Shows clear understanding of the advantages and disadvantages of using computer controlled machines in manufacturing, and gives suitable examples. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.</p> <p><b>Level 2 (3–4 marks)</b> Shows some understanding of the advantages and disadvantages of using computer controlled machines in manufacturing. There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented 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> Shows only limited understanding of the advantages and disadvantages of using computer controlled machines in manufacturing. There will be little or no use of specialist terms. Answers may be ambiguous or disorganised. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 = a response not worthy of a mark. Add 'Seen' at end of response</p>
			<b>Total</b>	<b>12</b>		
			<b>Paper Total</b>	<b>60</b>		

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