

Design and Technology

General Certificate of Secondary Education **A544**

Industrial Technology Technical Aspects of Designing and Making

Mark Scheme for June 2010

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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	(a)	<p>Complete the table to show the name of each tool and what the tool is used for.</p> <table> <tr> <td>Scriber</td> <td>Marking lines on metal</td> </tr> <tr> <td>Engineer's try square</td> <td>Marking/checking right angles</td> </tr> <tr> <td>Scribing block/surface gauge</td> <td></td> </tr> <tr> <td>Micrometer</td> <td>Accurate measurement of diameters/thicknesses</td> </tr> </table>	Scriber	Marking lines on metal	Engineer's try square	Marking/checking right angles	Scribing block/surface gauge		Micrometer	Accurate measurement of diameters/thicknesses	(1+1) (1+1) (1) (1+1)	Mark for use even if tool name incorrect.
Scriber	Marking lines on metal											
Engineer's try square	Marking/checking right angles											
Scribing block/surface gauge												
Micrometer	Accurate measurement of diameters/thicknesses											
1	(b)	<p>Give two reasons why a centre punch must be used to mark the centre of a hole before drilling.</p> <p>Stop drill skidding; help drill start cutting; position drill accurately</p>	(1+1)									
1	(c)	<p>Use sketches and notes to explain how a $\varnothing 45$ circle could be marked out centrally on a 50 square piece of 3mm thick mild steel.</p> <p>Sketch (es) with annotation to show: - use of layout fluid; scribing diagonals or measuring and using try-square. Punching centre; using dividers to mark circle. Three elements clearly shown.</p> <p>Allow 'dot punching' marked circle as part of response.</p>	(3x1)									
Total			[12]									

Question		Expected Answers	Marks	Rationale
2	(a)	<p>Give three safety precautions that should be taken when using a drilling machine.</p> <p>Goggles; guard; work held safely; drill tightened; hands away when drill turning; only one at machine; no loose clothing / long hair</p>	(3x1)	
2	(b)	<p>Complete the list below to show the stages needed to braze the hooks into the backplate.</p> <p>Stage 2 Clean hooks and backplate Stage 3 Fit hooks and apply flux Stage 4 Heat to red hot Stage 5 Apply brazing alloy / rod / spelter Stage 6 Leave to cool</p>	(5x1)	<p>Stages given to be in <u>acceptable</u> order.</p> <p>Allow flux adding during process.</p>
2	(c)	<p>Use sketches and notes to show a jig that could be used to make batches of hooks from lengths of Ø3 mild steel rod.</p> <p>The jig must :-</p> <ul style="list-style-type: none"> • Locate and hold for bending • allow each hook to be bent to the correct shape • allow the stem of each hook to be cut to the correct length. <p>Annotated sketch of jig to locate (1) and hold (1) rod for bending rod. Able to bend each hook to correct shape (1) and cut stem to length after bending (1)</p>	(4x1)	Note two marks for first specn. point
Total			[12]	

Question		Expected Answers	Marks	Rationale
3	(a)	<p>State what the letters HIPS stand for.</p> <p>High Impact Poly Styrene</p>	(1)	
3	(b)	<p>Give one reason why vacuum forming is a suitable process for making the display stand.</p> <p>Moulds cheaper than for other processes; most suitable for thin plastic; relatively cheap equipment; easy to change moulds if needed; easy to modify mould if needed</p>	(1)	Allow easy repetition of shaped objects.
3	(c)	<p>Use sketches and notes to explain the important features of a vacuum forming mould.</p> <p>Annotated sketch or notes to give details of:- sloping sides/draft angle; curved corners/fillet radii; smooth surface; vent holes 1 mark for each feature</p>	(3x1)	Clear explanation without sketch acceptable provided all points are adequately explained.
3	(d)	<p>Complete the list below to show the stages needed to produce a vacuum formed item.</p> <p>heat plastic; raise mould; vacuum on; switch off heat/vacuum 1 mark for each stage in suitable order</p>		Response must include 'heating plastic' to qualify for any marks.
3	(e)	<p>Explain the main features of a rapid prototyping system you are familiar with.</p> <p>Explanation to include reference to: 'slicing' 3D CAD drawing into 'layers; material use to produce prototype; use of laser / 'printer / cutter under computer control; brief description of process 1 mark for each factor/feature</p>	(3x1)	<p>Allow 1 mark for simple reference to CAD.</p> <p>RapidPro – laminated from self adhesive sheet cut to shape of layers. 3D printer. Stereolithography Laser sintering</p>
Total			[12]	

Question			Expected Answers	Marks	Rationale
4	(a)	(i)	Name a specific plastic suitable for making the body of kettle A. Suitable thermoplastic – HIPS; ABS ; POLYPROPYLENE (PP)	(1)	
4	(a)	(ii)	Name the industrial process used to manufacture the body of kettle A. Injection moulding	(1)	
4	(b)		Give two advantages to the user of kettle A compared with kettle B. Less chance of getting burned/scalded; easier to pour; easier to clean; water level indicator; switch better positioned; better electrical insulation; more energy efficient	(2x1)	'lighter' not accepted as suitable response
4	(c)		Explain how ergonomic principles can be used in the design of an electric kettle. Explanation of handle shape related to users hand; position of handle to give balance when full; position of switch for easy reach from handle	(1+1)	One mark for feature; one mark for explanation. Accept two features with simple description.

Question	Expected Answers	Marks	Rationale
4 (d)*	<p>Discuss the implications for manufacturers in considering 'end of life disposal' when designing products.</p> <p>Level 1 (0-2 marks)</p> <p>Shows no real understanding of the term 'end of life disposal', making only simplistic reference to recycling or waste disposal. The response will be disorganised and may also contain errors in both spelling and the use of grammar.</p> <p>Level 2 (3-4 marks)</p> <p>Shows some understanding of the meaning of the term and the need for safe disposal. Relates the issue to recycling/recovering of materials; uses specialist terms where appropriate and makes few spelling or grammatical errors in the presentation of a reasonably structured response.</p> <p>Level 3 (5-6 marks)</p> <p>Shows clear understanding of the issues involved, including the need for safe disposal of materials and waste and mandatory regulations where appropriate. The response will be well structured and demonstrate accurate use of spelling and the rules of grammar and punctuation.</p> <p>Responses may include reference to the following issues:</p> <p>recycling materials</p> <ul style="list-style-type: none"> • dismantling used products • re-using serviceable components • safe disposal of waste • reduction in landfill • reduction in use of raw materials • 'end of life disposal' regulations 	(6)	QWC rewarded in responses to this question.
	Total	[12]	

Question		Expected Answers	Marks	Rationale
5	(a)	<p>Name the industrial process used to produce the aluminium alloy tubing for the hanging rack shown in Fig. 4.</p> <p>Extrusion</p>	(1)	
5	(b)	<p>Explain why the batch production method is used.</p> <p>Explanation with reference to repeated accuracy; further orders; cost of tooling; quicker than one-off; less skilled labour needed</p> <p>One mark for factor; one mark for suitable explanation</p>	(1+1)	BOD for reference to batch size.
5	(c)	<p>Use sketches and notes to show how the top hanging rail could be joined to one of the uprights.</p> <p>The joint must allow for quick assembly and disassembly.</p> <p>Clearly communicated sketch (1) showing details of suitable joining method (1) allowing for quick assembly and disassembly.(1)</p>	(3x1)	
5	(d)*	<p>Explain the benefits of manufacturing the hanging rack as a flat pack.</p> <p>Level 1 (0-2 marks)</p> <p>A simplistic response referring to one or two of the more obvious benefits. Presentation will be in the form of brief statements with little or no justification. Errors in spelling, punctuation and grammar may impede clarity of responses.</p> <p>Level 2 (3-4 marks)</p> <p>Two or more benefits explained with reasonable clarity and using specialist terminology where appropriate. The response will be generally well structured and should contain very few errors in spelling, punctuation or grammar.</p> <p>Level 3 (5-6 marks)</p> <p>Detailed explanation relating to a number of benefits to both the manufacturer and the user. Benefits referred to will be clearly justified using specialist terminology wherever appropriate The response will be well structured and show competence in spelling and the application of the rules of grammar.</p>	(6)	QWC rewarded in responses to this question.

Question	Expected Answers	Marks	Rationale
	Responses may include reference to the following issues: <ul style="list-style-type: none"> • saves time / cost of assembly at factory • cheaper and quicker to produce • less space for storing finished product • cheaper to transport / more on delivery truck • simpler and cheaper to package • easier for customer to carry 		
	Total	[12]	
	Total marks for paper	[60]	

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