OCR
RECOGNISING ACHIEVEMENT

GCSE

Design and Technology

General Certificate of Secondary Education

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

Mark Scheme for June 2011

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Question			Expected Answers	Marks	Rationale
1	(a)	(i)	**Give the correct names of the tools below.** Tool B – (Split circular) Die Tool C – Tinsnips/Hand shears Tool D – File Tool E – (Twist) drill Tool F – Tap	(5x1)	
		(ii)	**Complete the table below to show which tool from Fig. 1 would be used for the processes given.** Starting off a hole on a centre lathe - Tool H Cutting a screw thread on a round bar - Tool B Cutting shapes out of 1mm thick copper sheet - Tool C	(3x1)	
	(b)		**State what the letters HSS stand for.** High Speed Steel	(1)	
	(c)		**Explain what is meant by hardening and tempering.** Explanation to include reference to heating and quenching to harden(1); Tempering to required colour and quenching (1); removing excess hardness/control hardness for a specific use (1)	(3x1)	
			Total	**[12]**	

Question			Expected Answers	Marks	Rationale
2	(a)		**Complete the table below by giving the stages needed to mark out the fixing plate shown in Fig. 2 ready for drilling. Give the names of tools or equipment needed at each stage.** 2 Odd legs/jenny calipers 3 Mark position of holes Try square and scriber 4 Centre punch for holes Centre/dot punch & hammer (or automatic centre punch)	(5x1)	Accept rule and scriber Allow rule and odd-legs / scribing block & surface plate
	(b)		**Explain why the fixing plate needs to be securely clamped before the holes are drilled.** To stop the metal spinning round/moving (1) which could cause injury/inaccuracy (1)	(1+1)	
	(c)	(i)	**Give two reasons why cast iron is a suitable material for the drilling table and base.** Heavy for stability; casts into awkward shapes; strong in compression; cheap to manufacture; durable	(1+1)	'Strong' and 'cheap' must be qualified or combined for mark.
		(ii)	**State the type of motion shown by arrows A and B in Fig. 3.** A – oscillating; rotary B – reciprocating; linear	(1+1)	
		(iii)	**Name of a mechanism that could be used to change the motion at arrow A into the motion at arrow B.** Rack and pinion	(1)	Allow use of a cam
			Total	**[12]**	

Question			Expected Answers	Marks	Rationale
3	(a)		**Explain the term 'non-ferrous alloy'.** Mixture of metals (1) that does not contain iron (1)	(1+1)	Accept reference to 'not rusting' for one mark only
	(b)		**Give two reasons why sand casting is a suitable process for making the number plate.** Good for making shaped parts; patterns can be used again; Process is cheaper than other methods; no/very little machining needed; little material wastage/waste material re-used	(1+1)	'Easy' and 'cheap' must be qualified
	(c)		**Give two important features of a sand casting pattern.** Draft angle; smooth surface; fillet radii; easy to remove from sand mould; re-usable/durable	(1+1)	
	(d*)		**Discuss the issues a manufacturer of castings would need to consider when changing from sand casting to die casting production.** Discussion may include consideration of the following points: Cost of new equipment/machinery Changes to factory layout Retraining of workforce Need to ensure customers for high-volume production Change in type of product (low melting point alloys) Higher output – storage/transport Energy costs Manufacture of tooling – in-house or buy-in Level 1 (0-2 marks) Shows limited understanding of casting production by the sand or die-casting processes.		

Question			Expected Answers	Marks	Rationale
			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. Level 2 (3-4 marks) Shows some understanding of the two processes and considers some of the issues relating to production changes. 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. Level 3 (5-6 marks) Shows clear understanding of the processes and their differences and gives details of the issues relating to production changes. 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.	(6)	
			Total	**[12]**	

Question			Expected Answers	Marks	Rationale
4	(a)		**Name one suitable industrial process for manufacturing bin A.** Injection moulding / rotational moulding	(1)	
	(b)	(i)	**Give one reason why polypropylene is a suitable material for making bin A.** Moulds easily into shape; easy to clean; flexible to resist knocks/denting; self finishing; gives a lightweight bin; can be recycled	(1)	
		(ii)	**State one suitable finishing process for bin B.** Painting; lacquering/varnishing; plastic/powder coating; galvanising; oil blueing	(1)	
	(c)		**Explain why bin A would be cheaper to mass produce than bin B.** Clear explanation (1) referring to speed of production ; minimum waste material ; no surface finishing required ; shape made in one 'shot' ; less manual labour required; simple design so easy to produce	(3)	Clear explanation required for full marks
	(d)		**State two pieces of information given by the symbol shown in Fig. 6.** Arrow triangle (mobius loop) shows that it is recyclable The number shows the type of plastic	(1+1)	

Question			Expected Answers	Marks	Rationale
	(e)		**Use sketches and notes to show how waste bin B can be modified to overcome these faults.** Annotated (1) sketch (1) to show improved design with ease of emptying (1)and stability (1)	(4)	One sketch for both improvements is acceptable, but both points must be addressed for 3/4 marks
			Total	**[12]**	

Question			Expected Answers	Marks	Rationale
5	(a)		**Explain how CAD/CAM could be used to design and make the mould for the prototype bodyshell.** Explanation to include reference to use of CAD software when designing the bodyshell (1); the link between CAD and CAM (1); computer control of machines to produce the mould(1)	(3)	
	(b)		**Use sketches and notes to show how the prototype bodyshell shown in Fig. 7 could be produced by vacuum forming.** Annotated sketch(es) to describe the important aspects of the vacuum forming process e.g: Positioning of mould; plastic sheet above mould; clamped plastic sheet; applying vacuum; heated plastic formed around mould	(3)	
	(c*)		**Discuss the benefits of 'Rapid Prototyping' systems compared with more traditional prototyping methods.** Discussion may include consideration of the following points: Speed of production Less manual work involved Ability to produce otherwise difficult/impossible shapes Cost effective by comparison Cleaner working environment Less tooling/equipment required Range of materials possible Design changes quickly remodelled Level 1 (0-2 marks) Shows limited understanding of rapid prototyping or traditional methods of making prototypes.		

Question			Expected Answers	Marks	Rationale
			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. Level 2 (3-4 marks) Shows some understanding of rapid prototyping and how it compares with traditional methods and issues. 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. Level 3 (5-6 marks) Shows clear understanding of rapid prototyping and gives details relating to comparisons with traditional methods. 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.	(6)	
			Total	**[12]**	
			Total marks for paper	**[60]**	

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