

# **Design & Technology (Industrial Technology)**

General Certificate of Secondary Education **GCSE J304**

General Certificate of Secondary Education (Short Course) **GCSE J044**

## **Mark Schemes for the Units**

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**January 2010**

**J044/J304//MS/R/10J**

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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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Design and Technology (Industrial Technology) (J304)**

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## A542 Sustainable design

Please note that the following mark scheme and the associated question paper have not been used as part of live assessment and are provided as additional specimen assessment material only. The mark scheme has not been subject to refinement and finalisation by examiners at a standardisation meeting.

Question		Expected Answer	Mark	Rationale
<b>Section A</b>				
1		<b>This symbol stands for:</b>  c	[1]	This is the only acceptable answer
2		<b>Which of these materials is the most difficult to recycle?</b>  c	[1]	This is the only acceptable answer
3		<b>Standard components are used in a design to:</b>  d	[1]	This is the only acceptable answer
4		<b>Waste materials that are not able to decompose easily in the environment are called:</b>  a	[1]	This is the only acceptable answer
5		<b>Companies may pay to be allowed to exceed their carbon dioxide emission limit. This is known as:</b>  d	[1]	This is the only acceptable answer
6		<b>What is the 'term' used when a product is adapted to suit an alternative use?</b>  Reuse	[1]	This is the only acceptable answer

Question		Expected Answer	Mark	Rationale
7		<p><b>What is the official term applied to the assessment of potential dangers in a work area?</b></p> <p>Risk Assessment</p>	[1]	This is the only acceptable answer
8		<p><b>Give one example of a renewable energy source.</b></p> <p>Any one of: The Sun (solar); Wind; Water (tide, wave and potential due to gravity); Biomass; Underground heat (geothermal).</p>	[1]	Although the words in brackets are not the source, for this question accept those terms as correct
9		<p><b>Give one example of a non-renewable energy source.</b></p> <p>Any one of: Fossil fuels: coal; oil; natural gas; uranium (nuclear).</p>	[1]	Accept 'nuclear' although it is not a source
10		<p><b>What is the term used when companies operate internationally and produce goods in any country?</b></p> <p>Multinational or Global</p>	[1]	Accept either term
11		<p><b>Plastics are a renewable resource.</b></p> <p>True</p>	[1]	This or wording that indicates correct knowledge
12		<p><b>Thermoplastics cannot be recycled.</b></p> <p>False</p>	[1]	This is the only acceptable answer
13		<p><b>A renewable energy source can only be renewed after 15 years.</b></p> <p>False</p>	[1]	This is the only acceptable answer

Question		Expected Answer	Mark	Rationale
14		<b>Lead based paints should be used on toys for young children.</b>  False	<b>[1]</b>	This is the only acceptable answer
15		<b>Transportation of materials and goods adds to the carbon footprint of a product.</b>  True	<b>[1]</b>	This is the only acceptable answer
		<b>Section A Total</b>	<b>[15]</b>	

Question			Expected Answer	Mark	Rationale
<b>Section B</b>					
16	(a)	(i)	<p><b>Name the material indicated by this sign.</b></p> <p>High density polyethylene</p>	[2]	Accept 'High Density Polythene' but not just 'polyethylene' nor 'Polythene'
16	(a)	(ii)	<p><b>What does this sign indicate about the packaging material?</b></p> <p>Non-recyclable</p>	[1]	This is the only acceptable answer
16	(b)		<p><b>Give <u>two</u> environmental factors that should be considered when designing packaging for products.</b></p> <p>Any two of:            Whether the material used is bio-degradable            Whether the packaging will harm the environment            Whether the packaging will harm people            Whether the use of the packaging material will deplete resources            Whether the use of the packaging will significantly increase the carbon footprint of the product</p>	[3] [3]	Only accept answers that refer to environmental factors. One mark should be awarded for simply naming the factor – two further marks for specifically referring to the way it pertains to the design of packaging. (x2)

Question		Expected Answer	Mark	Rationale
16	*(c)	<p><b>Discuss how a designer should consider a product's impact on the environment.</b></p> <p>Discussion should include considerations at each stage of the product's life cycle: raw materials; production; transportation; during its useful lifespan; disposal/recycling/reusing.</p>	[6]	<p>Level 1 (1-2) Basic discussion, mainly about disposal/recycling</p> <p>Level 2 (3-4) Adequate discussion referring to some stages of the product's life cycle</p> <p>Level 3 (5-6) Full discussion, referring to most/all stages of the product's life cycle</p>
<b>Question total</b>			<b>[15]</b>	



Question		Expected Answer	Mark	Rationale
17	(a)	(i)	[3]	Marks must only be awarded for points that refer to the manufacturing method.
		(ii)	[3]	
17	(b)	<p><b>Give <u>three</u> dangers faced by the operator, when using tools and materials associated with Injection Moulding.</b></p> <p>Any three from:            Danger from hot plastics spills; failure of guards at the hopper area/mould area/injection area; danger from moving parts: mould parts and injector; fume inhalation; dust inhalation.</p>	[3]	This question is concerned with 'safety issues' and 'conditions of working'. Allow answers that only deal with the dangers associated with tools, and those that only deal with the dangers associated with materials. i.e. <i>any</i> three from the list.
17	(c)	<p><b>Explain <u>two</u> safety considerations of well-designed toys for young children.</b></p> <p>Any two of these:            Materials should cause no harm to children.            Materials should not be brittle.            Should not contain small pieces.            Should not have sharp edges.            Should not be heavy enough to cause harm.            Should be robust enough resist breaking into small pieces.            Should not have finger traps.</p>	[3]	For each, award one mark for identifying the safety consideration and two marks for a full explanation
<b>Question total</b>			<b>[15]</b>	

Question		Expected Answer	Mark	Rationale
18	(a)	<p><b>Give <u>three</u> safe working practices that should be followed in a workshop</b></p> <p>Any three of:            Work area should be kept tidy            Floor area should be kept clear            Appropriate safety wear should be used: ear defenders, eye protection, face masks, apron/workshop coat should be worn, appropriate shoes should be worn            Guards should be used            Workers should be familiar with emergency procedures            Workers should be familiar with the safety information available about the materials, the equipment and the processes used.</p>	[3]	Statements are acceptable, there is no need to expand on the chosen working practices
18	(b)	<p><b>State <u>two</u> energy sources and for each, consider the environmental effects of their extensive use in the production of electricity.</b></p> <p><b>Any two from:</b>            The Sun (solar), Wind, Water (tide, wave and potential due to gravity), Underground heat (geothermal) – for these, the environmental effects are visual pollution with some natural habitats affected.</p> <p>Biomass – for this, natural habitats affected, damage to the atmosphere, damage to land (dust-bowl affect due to large field intensive crop production).</p> <p>Coal, Oil, Natural Gas – for these, visual pollution, atmospheric pollution.</p> <p>Uranium (nuclear) – natural habitats affected (due to waste heat), the threat of environmental pollution during the long term potential dangers from waste products</p>	[1] [2] [1] [2]	<p>For each of the two chosen:</p> <p>One mark should be awarded for stating the energy source (accept the terms in brackets although they are not the source)</p> <p>Two marks should be awarded for the environmental considerations</p>

Question			Expected Answer	Mark	Rationale
18	(c)	(i)	<p><b>Explain how the Ethical Trading Initiative (ETI) and the Fair Trade Foundation attempt to address these moral issues.</b></p> <p>Explanation should include some of:</p> <p>Ethical Trading Initiative:</p> <p>Is working to encourage corporate responsibility for workers' rights. It seeks a corporate commitment to the improvement of working conditions and wages It encourages the development of policies that put Checks in place concerning workers' rights. It encourages corrective action when checks reveal that improvements should be made. It encourages retailers to make sure that their staff and suppliers get adequate training and support. It encourages the inclusion of ethical principles into core business decisions. It encourages retailers to collaborate with each other and with other agencies including trade unions and charitable organisations regarding workers' issues.</p>	[3]	<p>ETI is solely concerned with the rights of workers Only accept answer that specifically refer to workers The ETI only encourages, it has no power to impose its standards when workers rights are deemed to be unacceptable</p>
18	(c)	(ii)	<p><b>Fair Trade Foundation</b></p> <p>The organisation is committed to tackling poverty and injustice through trade. It uses certification and labelling as a tool for developing its goals (Fair Trade mark). Attempts to bring together producers and consumers in a citizens' movement for change.</p>	[3]	<p>The Fair Trade Foundation attempts to address issues of poverty Only accept answers that refer to poverty or exploitation through the under-pricing of products when purchased from the producer/manufacturer</p>
<b>Question Total</b>				<b>[15]</b>	

## A544 Technical aspects of design and making

Please note that the following mark scheme and the associated question paper have not been used as part of live assessment and are provided as additional specimen assessment material only. The mark scheme has not been subject to refinement and finalisation by examiners at a standardisation meeting.

Question		Expected Answers	Marks	Rationale																					
1	(a)	<p>Complete the table below to show the tool number and correct name of the tool used to carry out each of the processes shown</p> <table border="0"> <tr> <td>Marking the position of a hole</td> <td>9</td> <td>Centre Punch</td> <td>(1+1)</td> <td rowspan="5">Not hacksaw</td> </tr> <tr> <td>Cutting 3mm steel wire</td> <td>3</td> <td>Junior hacksaw</td> <td>(1+1)</td> </tr> <tr> <td>Cutting screw thread in hole</td> <td>1</td> <td>Tap</td> <td>(1+1)</td> </tr> <tr> <td>Accurately measuring thickness</td> <td>2</td> <td>Micrometer</td> <td>(1+1)</td> </tr> <tr> <td>Marking circles and curves</td> <td>8</td> <td>Dividers</td> <td>(1+1)</td> </tr> </table>	Marking the position of a hole	9	Centre Punch	(1+1)	Not hacksaw	Cutting 3mm steel wire	3	Junior hacksaw	(1+1)	Cutting screw thread in hole	1	Tap	(1+1)	Accurately measuring thickness	2	Micrometer	(1+1)	Marking circles and curves	8	Dividers	(1+1)		
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Cutting screw thread in hole	1	Tap	(1+1)																						
Accurately measuring thickness	2	Micrometer	(1+1)																						
Marking circles and curves	8	Dividers	(1+1)																						
1	(b)	<p>Give two reasons why cast iron is a suitable material for an engineer's bench vice.</p> <p>Strength; easy to cast into shape; self-lubricating properties; inexpensive</p>	(1+1)	Strength acceptable for a mark at this level.																					
		<b>Total</b>	<b>[12]</b>																						
2	(a)	(i) <p>Draw the net (development) of the pulley bracket on the blank shown below.</p> <p>Correct shape (1); full use of blank (1)</p>	(1+1)	Position of holes not necessary, but allowable.																					
2	(a)	(ii) <p>Name a device that could be made to help mark out batches of the pulley bracket more easily.</p> <p>Template / pattern</p>	(1)																						
2	(a)	(iii) <p>Give two ways of making lines stand out more clearly when marking out metal.</p> <p>Marking Blue / Layout fluid / Felt marker ; Centre / Dot punch outline</p>	(1+1)																						

Question		Expected Answers	Marks	Rationale
2	(a) (iv)	<b>Name three cutting tools that could be used when cutting out the shape of the net for the pulley bracket.</b> Bench or Hand shears / Tin snips; Junior hacksaw / piercing saw; File; laser/plasma cutter (allow drill)	(3x1)	
2	(b)	<b>Use sketches and notes to show how the net could be bent into the shape of the pulley bracket.</b> Use of vice (first bend) (1); use of folding bars or square bar (1); Use of mallet to bend (1)	(3x1)	Max 2 marks if hammer used instead of mallet
2	(c)	Presswork / stamping	(1)	
		<b>Total</b>	<b>[12]</b>	
3	(a)	Stage 2 Cut corner with hacksaw ( allow junior ) Stage 3 File (to shape) Stage 4 Remove burrs / sharp edges	(3x1)	
3	(b)	Brazing; silver soldering; welding; riveting	(1+1)	
3	(c)	plastic coating; blueing /oil blackening	(1)	
3	(d)	Annotated (1) sketch to show workable jig – (3x1) for each specification point.	(4x1)	
3	(e)	Suitable modification (1) suitably communicated (1)	(1+1)	<b>Clear explanation</b> without sketch acceptable for full marks.
		<b>Total</b>	<b>[12]</b>	
4	(a)	Easy to make changes; no storage of paper drawings / easy to save; easy to share designs; ability to change to 3D; ability to import; quicker to produce designs	(2x1)	
4	(b)	Clearly communicated design(1) with suitable feature(s) (1) larger base for stability; repositioned handle; redesigned handle; additional handle; no sharp corners	(1+1)	<b>Clear explanation</b> without sketch acceptable for full marks.
4	(c)	One mark for 'Smart' material; one mark for improvement	(1+1)	

Question	Expected Answers	Marks	Rationale
4 (d)*	<p>Level 1 (0-2 marks) Makes some mention of environmental effects but shows limited understanding. Answer consists of simplistic statements that are presented using poor punctuation and spelling.</p> <p>Level 2 (3-4 marks) Shows some understanding and presents a reasonable analysis of two environmental effects. Makes some use of specialist terminology where appropriate and makes only occasional errors in spelling, punctuation and grammar.</p> <p>Level 3 (5-6 marks) Presents a detailed analysis of two or more environmental effects, including both positive and negative effects. Shows clear understanding of the issues involved. Specialist terms are widely and correctly used in a well structure response with few or no spelling or grammatical errors.</p> <p>Responses may include reference to the following issues:</p> <ul style="list-style-type: none"> <li>• energy usage for extraction and manufacture</li> <li>• fumes from manufacturing (material and products)</li> <li>• filling of landfill / non-biodegradable</li> <li>• damage of waste to wildlife / ecology</li> <li>• reduction in use of other raw materials</li> <li>• recycling reduces raw material usage</li> </ul>	(6)	
	<b>Total</b>	[12]	
5 (a)	How many products; repeat batches needed; cost of equipment needed; resources available at company	(1+1)	
5 (b)	Clear explanation (1) to include reference to suppliers' responsibility for quality and delivery to assembly plant(1); removal of necessity for storage of components (1); batches of required components produced only when needed (1); more manufacturing space (1)	(3x1)	
5 (c)	Assembly; welding; spraying; component handling; tool changing in machines (1)	(1)	

Question	Expected Answers	Marks	Rationale
5 (d)*	<p>Level 1 (0-2 marks)            Makes some reference to operation(s) commonly carried out by robots but shows little or no understanding of the issues to be considered. Answer consists of simplistic statements that are presented using poor punctuation and spelling.</p> <p>Level 2 (3-4 marks)            Shows some understanding of two issues when introducing robots, referring to more than simply the tasks they perform. The response will be reasonably well structured with only occasional errors in spelling, punctuation or grammar.</p> <p>Level 3 (5-6 marks)            A clear and detailed discussion of the issues involved including reference to advantages and potential disadvantages. Specialist terminology will be used correctly where appropriate and the response will exhibit accuracy in both spelling and use of grammar.            Responses may include reference to the following issues:</p> <ul style="list-style-type: none"> <li>• high cost of purchase and set-up</li> <li>• robots able to work non-stop in any conditions</li> <li>• reduced labour costs / jobs for workers</li> <li>• skilled workers needed to set-up and maintain robots</li> <li>• consistency of outcomes / quality of products</li> <li>• easier and cheaper to re-program than to retrain workers</li> </ul>	(6)	
	<b>Total</b>	<b>[12]</b>	
	<b>Total marks for paper</b>	<b>[60]</b>	

# **Grade Thresholds**

**General Certificate of Secondary Education  
Design and Technology (Industrial Technology) (J044 J304)**

**January 2010 Examination Series**

**Component Threshold Marks**

There were no entries for examinations A542 and A544 this series.



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