



**GCSE**

## **Design and Technology: Industrial Technology**

Unit **A545**: Sustainability and technical aspects of designing and making

General Certificate of Secondary Education

### **Mark Scheme for June 2015**

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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.

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**Annotations**

Used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions)

**Subject specific -**

Annotation	Meaning
<b>BOD</b>	Benefit of doubt
	Caret sign to show omission
<b>L1</b>	Level 1
<b>L2</b>	Level 2
<b>L3</b>	Level 3
<b>REP</b>	Repeat
<b>SEEN</b>	Noted but no credit given
	Tick

## Section A

Question		Answer	Mark	Guidance
1		a	1	Only acceptable answer.
2		c	1	Only acceptable answer.
3		c	1	Only acceptable answer.
4		c	1	Only acceptable answer.
5		b	1	Only acceptable answer.
6		Wind, hydro, solar, tidal, geothermal	1	Any one acceptable answer.
7		Polyvinyl chloride	1	Only acceptable answer.
8		Sweat shop/unethical	1	Accept either answer.
9		Refuse	1	Only acceptable answer.
10		Eco footprint/carbon footprint	1	Accept either answer.
11		Biodegradable products harm the environment	1	False
12		Polypropylene cannot be recycled	1	False
13		Oil is a renewable source of energy	1	False
14		Risk assessment identifies dangerous situations in the workplace	1	True
15		Insulating homes reduces energy consumption	1	True
		<b>Total</b>	<b>15</b>	
16	(a)	Examples: Wood is a sustainable resource Wood is biodegradable Extraction of iron ore causes permanent scarring of a landscape Mining of iron ore disturbs animal habitats Processing and manufacture of steel frame uses more Energy, causing pollution Easily formed using little or no energy	(3x1)	One mark for each of three realistic benefits  NOT simply recyclable. Reference to comparative energy use needed for mark

Question		Answer	Mark	Guidance
16	(b)	<p>Up to three marks for a reasoned explanation.</p> <p>Example: An ethical company is one in which the employees have good working conditions and a fair rate of pay. The company also shows environmental awareness. Sometimes called 'sweatshop free'</p>	3	<p>One point briefly mentioned 1 mark One point with justification 2 marks</p> <p>Reference to working conditions required for full marks Allow reference to 'Fair Trade' for one mark only</p>

Question		Answer	Marks	Content	Guidance
					Levels of response
16	(c)*	<p>Up to six marks for a detailed explanation of the process of eco-design and how it helps reduce harm to the environment.</p>		<p>Explanation may include reference to the following points:</p> <p>Eco-design involves the whole system of looking at an end product, from design to finished article, its use of materials and energy.</p> <p>The life cycle of the product can be divided into procurement, manufacture, use and disposal.</p> <p>Eco-design is the process of designing a product from scratch with the environment in mind and trying to minimise environmental damage over the whole product life cycle.</p> <p>To be eco-designed a designer must work through the following stages: product planning; product development; design process; functionality; safety; ergonomics; technical issues/requirements;</p>	<p><b>Level 3 (5-6 marks)</b> Thorough <b>explanation</b>, showing a good understanding of the issues. There will be three or more clearly identified and explained points. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate will demonstrate the accurate use of spelling, punctuation and grammar.</p> <p><b>Level 2 (3-4 marks)</b> Adequate <b>explanation</b>, showing reasonable understanding of the 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</p> <p><b>Level 1 (1-2 marks)</b> Basic <b>explanation</b>, showing some understanding of the issues. There will be little or no use of specialist terms. Answers may be ambiguous or disorganised or 'list like'. Errors of grammar, punctuation and spelling may be intrusive.</p>

Question		Answer	Marks	Guidance	
				Content	Levels of response
			6	<p>design aesthetics</p> <p>Analysis includes consumption of resources; emissions to air, water, and the ground; health matters (e.g. noise and vibration).</p> <p>Hazardous waste and final emissions to the environment (e.g. methane and leaching from landfills are inventoried).</p> <p>Consumables, materials and parts used all have indirect environmental consequences.</p>	<p>0 - a response not worthy of a mark. Add 'Seen' at end of response.</p> <p>Do not apply ticks or annotations to 'Levels of response' questions.</p> <p>Mark these by reading all of the answer then decide on an appropriate level and a specific mark.</p>

Question		Answer	Mark	Guidance
16	(d)	<p>One mark for each specification point adequately covered in a workable solution, plus one additional mark for clarity of notes/annotations</p> <p>(4x1)</p>	4	
	(e)	<p>One mark for each of two suitable response</p> <p>Examples:</p> <p>The power supply is sustainable.</p> <p>Batteries do not need to be charged using fossil fuels</p> <p>Batteries do not need to be manufactured thus saving materials</p> <p>Batteries do not need to be manufactured saving energy use.</p> <p>Batteries do not need to be disposed of in landfill sites.</p>	2	
	(f)	<p>Enabling the dynamo to be easily dissembled means that it can be separated into different materials, so that the dynamo can be recycled successfully.</p>	2	Justified response needed for full marks
		<b>Total</b>	<b>20</b>	

## Section B

Question		Answer	Mark	Guidance
17	(a)	Iron; any steel (including stainless); cast iron; wrought iron (2x1)	2	
	(b)	Scriber - marking lines on pieces of metal Dividers - drawing circles and curves on metal Scribing block/surface gauge - used on a surface plate for drawing lines parallel to an edge/checking levels (6x1)	6	Name not needed to allow mark for use
	(c)	Description may include reference to drawing diagonals using rule and scribe; use of odd-legs to find centres in two directions; using steel rule, try square and scribe. (2x1)	2	Appropriate tools to be mentioned for full marks.
	(d) (i)	Machine vice	1	
	(ii)	One mark for relevant precaution; additional mark for justification/reason  Examples: Wear goggles(1) to stop swarf going in eyes (1) Take chuck key out (1) to stop it flying out and hitting someone (1) 2 x (1+1)	4	Appropriate justification needed for second mark
		<b>Total</b>	<b>15</b>	

Question		Answer	Mark	Guidance
18	(a)	2 Clean pegs with emery cloth and fit to baseplate 3 Apply flux to joints 4 Heat with brazing torch until red hot 5 Apply brazing rod to melt into the joints (4x1)	4	Accept application of brazing alloy 'bits' (spelter) to joints before heating Allow credit for other 'workable' method Max. 2 marks if flux not used
	(b) (i)	5.0mm	1	
	(ii)	(Taper) Tap and tap wrench (2x1)	2	Accept taper tap for first mark and either second or plug tap for a second mark
	(c) (i)	Facing Knurling (Plain) Turning Parting off (4x1)	4	Accept parallel turning
	(ii)	High carbon (tool) steel; HSS; Tungsten carbide/ceramic (2x1)	2	
	(d)	Laser cutter; milling machine; machining centre; router; water jet cutter; 3D printer (2x1)	2	Accept vinyl cutter
		<b>Total</b>	<b>15</b>	

Question		Answer	Mark	Guidance
19	(a)	<p>One mark for each of two good reasons</p> <p>Examples: Easy to form into shape; no finishing needed; is a rigid plastic; relatively cheap material; easily machined</p> <p>(2x1)</p>	2	Two simplistic responses one mark only
	(b)	ABS; HIPS; Nylon (polyamide); Polypropylene; PVC; PETE; Polyethylene (3x1)	3	
	(c)	<p>Up to two marks for each spec. point clearly shown <u>and</u> annotated.</p> <p>Eg: strengthening fillets fitted into angle Slots to remove files more easily</p> <p>(4x1)</p>	4	

Question		Answer	Marks	Guidance	
				Content	Levels of response
19	(d)*	Up to six marks for a discussion or detailed evaluation of the advantages and disadvantages of using CAD/CAM when designing and developing products.		<p>Response may include consideration of the following points:</p> <p>Advantages: Designs easy to modify in CAD Ability to import features Electronic storage takes up less space Designs can be shared with others electronically 3D images/animations possible Designs can be imported into CAM CNC machines / rapid prototyping machines can make prototypes quickly. Reduction in manual workers</p>	<p><b>Level 3 (5-6 marks)</b> Thorough explanation, showing a clear understanding of the advantages and disadvantages of using CAD/CAM when designing and developing products. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate will demonstrate the accurate use of spelling, punctuation and grammar.</p> <p><b>Level 2 (3-4 marks)</b> Adequate explanation, showing some understanding of the advantages and disadvantages of using CAD/CAM when designing and developing 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>

Question		Answer	Marks	Guidance	
				Content	Levels of response
			6	<p>Faster 'lead-time' for new products</p> <p>Disadvantages:</p> <p>Equipment expensive to buy</p> <p>Staff need to be trained</p> <p>Traditional skills may be lost</p> <p>Full marks possible if only CAD is covered, provided response is detailed and well presented</p>	<p><b>Level 1 (1-2 marks)</b> Basic explanation, showing only limited understanding of the advantages and disadvantages of using CAD/CAM when designing and developing products. There will be little or no use of specialist terms. Answers may be ambiguous, disorganised or 'list like'. 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> <p>Do not apply ticks or annotations to 'Levels of response' questions.</p> <p>Mark these by reading all the answer, decide on an appropriate level, then a specific mark.</p>
<b>Total for question</b>		<b>15</b>			
<b>Total for paper</b>		<b>80</b>			

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