



**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 2018**

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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

A  tick is to be used to show where a mark has been awarded.








Marks awarded must be equal to the number of ticks show. (This does not apply to banded questions).

**Do not** use 

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Banded mark scheme questions to show **L1, L2** or, **L3 only** – do not use ticks.

Where a **list or bullet points** have been used to answer the Banded Mark Scheme question a **maximum mark of 2** is to be given.

	L1	Level 1	Use in banded mark scheme responses only
	L2	Level 2	Use in banded mark scheme responses only
	L3	Level 3	Use in banded mark scheme responses only
	REP	Repeat	Use when additional response seen, but is restating the previous point
	SEEN	Noted but no credit given	Only to be used to acknowledge additional answer sheets or when an answer has been seen, but warrants no marks
	Tick	Tick	Ticks must be used to show where a mark has been awarded. Marks awarded must be equal to the number of ticks show. (This does not apply to banded questions).
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## Section A

Question			Answer	Marks	Guidance
1			c	1	Only acceptable answer.
2			d	1	Only acceptable answer.
3			c	1	Only acceptable answer.
4			b	1	Only acceptable answer.
5			a	1	Only acceptable answer.
6			Ozone (layer)	1	Only acceptable answer.
7			Ethical Trading Initiative	1	Only acceptable answers.
8			Solar (Power)	1	Only acceptable answer.
9			Reduce	1	Only acceptable answer.
10			Globalisation	1	Only acceptable answer.
11			False	1	Only acceptable answer.

Question			Answer	Marks	Guidance
12			True	1	Only acceptable answer.
13			True	1	Only acceptable answer.
14			True	1	Only acceptable answer.
15			False	1	Only acceptable answer.
16	(a)		<p>Up to two marks for each of two benefits explained e.g.:</p> <ul style="list-style-type: none"> <li>• Use of recycled plastic reduces the need to extract raw materials and helps protect the physical environment.</li> <li>• Use of recycled materials cuts down on energy required to extract raw materials.</li> <li>• Use of recycled materials reduces the energy required to process raw materials.</li> <li>• Use of recycled plastics reduces the need to use landfill or incineration, which both cause pollution.</li> <li>• No finish required – pre-coloured.</li> <li>• Does not rot so very long lasting.</li> <li>• Can be recycled again</li> </ul>	4	<p>2 marks for a correctly explained/justified point – max 4</p> <p>Accept other <i>valid</i> benefits</p>

Question			Answer	Marks	Guidance
16	(b)	(i)	<p>Up to three marks for an explanation e.g.:</p> <p>Carbon footprint is a measure of the impact of human activities (1), on the environment (1), in terms of the amount of greenhouse gases produced through carbon dioxide (1).</p>	3	<p>1 mark for each point identified and explained – max 3. Only 1 mark for reference to global warming.</p> <p>Accept other <i>valid</i> explanations</p>
16	(b)	(ii)	<p>Up to three marks for an explanation e.g.:</p> <p>Carbon offsetting is a method by which people and companies (1) can take measures (1), to offset the impact that they have on the environment in terms of carbon footprint (1).</p>	3	<p>1 mark for each point identified and explained – max 3. Only 1 mark for reference to using renewable energy.</p> <p>Accept other <i>valid</i> explanations</p>
16	(c)		<p>1 mark for suitable thermoplastic.</p> <p>Examples: PP; ABS; HIPS; PET</p> <p>Up to 3 marks for a working solution. Example: 1 mark for accommodating the post. 1 mark for a suitably rigid anchor 1 mark for indicating how the anchor will be attached to the (concrete) base. 1 mark for minimal material usage</p>	4	<p>Points need to be clearly covered for full marks</p>

Question			Answer	Marks	Guidance	
					Content	Levels of Response
16	(d)*		Up to six marks for a thorough discussion, using examples, of how a working knowledge of the 6Rs can help a designer lower the eco footprint of products.		<p>The eco footprint of a product refers to its effects on the environment from conception of an idea, to final disposal. The discussion must focus on the way a working application of the 6Rs can help to reduce a product's eco footprint.</p> <p><b>Rethinking</b> a product so that it can do its job better and be made more energy efficiently, and be designed for disassembly to conserve energy and resources.</p> <p><b>Reuse</b> of a product in terms of which parts can be used again, or does it have another valuable use without further processing?</p> <p><b>Recycle</b> – Design so a product is easy is to take apart and be used again or recycled. How much energy is required to recycle it efficiently?</p> <p><b>Repair</b> – consider which parts can be replaced easily, and design products to last with maintenance and simple repairs.</p> <p><b>Reduce</b> – Reduce parts and materials needed to make a product to conserve energy and resources.</p>	<p><b>Level 3 (5-6 marks)</b> Thorough <b>discussion</b>. 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>discussion</b>, showing some understanding. 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 (0-2 marks)</b> Basic <b>discussion</b>. 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. List of <b>one</b> or <b>two</b> points maximum <b>one</b> mark. List of <b>three</b> or more maximum <b>two</b> marks. 0 = Response worthy of no credit.</p>

Question			Answer	Marks	Guidance	
					Content	Levels of Response
				6	<b>Refuse</b> – choose and use materials and processes which cause less harm, or use less energy than those presently used. Refuse to package products beyond what is necessary.	



## Section B

Question			Answer	Mark	Guidance
17	(a)		<b>Cast iron</b> - Ferrous metal or alloy <b>HIPS</b> - Thermoplastic <b>Brass</b> - Non-ferrous metal or alloy <b>Aluminium</b> - Non-ferrous metal <b>Acrylic</b> - Thermoplastic <b>Stainless steel</b> - Ferrous metal or alloy (6x1)	6	NOT 'alloy' for Aluminium
	(b)		One mark for each of two valid reasons  Examples: Thermoplastics are available in a range of colours / are self-finishing Thermoplastics are normally easier to form into complex shapes than metals Products can often be made in one piece from thermoplastics Thermoplastics can be more suitable for mass production than metals Products made from thermoplastics are normally lighter than metal products Thermoplastics do not corrode / rust Not affected by rain / weather Can be recycled again (2x1)	2	One-word answers not acceptable  Accept other <i>valid</i> reasons
	(c)	(i)	One mark for each of two heat treatment processes named  Hardening; tempering; annealing; normalising; case hardening; induction/laser hardening (2x1)	2	Do NOT accept quenching

Question			Answer	Mark	Guidance
		(ii)	<p>One mark for each of two appropriate safety precautions</p> <p>Examples:  Wear goggles/visor to protect eyes  Wear a leather apron to prevent burns  Wear leather gloves to protect hands  Have good ventilation/extraction  Have water and first aid available  Use tongs to handle workpiece  Strong footwear</p> <p>(2x1)</p>	2	Accept other <i>appropriate</i> precautions, but reference to PPE must be specific, not simply 'wear suitable PPE'
		(d)	<p>One mark for a valid example and up to two further marks for a suitable explanation</p> <p>Example:  A composite material is made by combining two or more different materials (1) to make one with better/different properties (1). Carbon fibre/GRP is a composite material</p> <p>(3x1)</p>	3	
18	(a)	(i)	<p>One mark for each of four appropriate tools</p> <p>Examples:  Scriber; rule(r); try-square; odd-legged calipers; centre punch; surface gauge/scribing block; hammer; template</p> <p>(4x1)</p>	4	Do not accept marking/engineer's blue or layout fluid
		(ii)	<p>One mark for each of three possible methods</p> <p>Brazing; silver soldering; (soft) soldering; riveting; welding; cyanoacrylate adhesive (superglue)</p> <p>(3x1)</p>	3	Nuts and bolts not appropriate – repetition of 'screws' NOT simply 'glue/adhesive' – must be specific
	(b)	(i)	Round-nosed tool	1	

Question			Answer	Mark	Guidance
		(ii)	One mark for each of three correctly named parts  A - Saddle B - Compound slide/top slide C - Cross slide (3x1)	3	Accept other <i>suitably descriptive</i> responses
		(iii)	Part B – compound/top slide	1	Accept Part B
	(c)		One mark for each of three appropriate safety precautions  Examples: Put guard down over the chuck Make sure the work is tight in the chuck Remove chuck key before switching machine on Check where emergency stop button is Don't use it unless you've been trained Keep workplace clear / no distractions Ensure correct speed / depth of cut is being used (3x1)	3	No marks for PPE, but accept 'tie hair back'  Accept other <i>appropriate</i> safety precautions
19	(a)		One mark for each of two plastics moulding processes  Examples; Injection moulding; vacuum forming; press moulding; extrusion; blow moulding; rotational moulding; compression moulding; transfer moulding (2x1)	2	
	(b)		One mark for each bullet point appropriately addressed plus one additional mark for a clearly presented workable solution. (4x1)	4	Solution must be an 'improvement' to the original design, not a complete re-design. Max. 2 marks for a re-design that meets the specification.
	(c)		Up to three marks for a clear description of a rapid prototyping process.		

Question			Answer	Mark	Guidance
			Description must include reference to the three basic elements; Computer generation of 3D image of product 3D image 'sliced' into thin layers by computer software Solid 3D model built-up by stereolithography/3D printing/laser sintering; lamination (3x1)	3	

Question			Answer	Marks	Guidance	
					Content	Levels of response
19	(d)*		Up to six marks for a clear explanation, using examples, of the impact of modern technologies on industrial production		Response may include consideration of the following points.  Automatic/CNC machines causing loss of manual jobs. More consistent accuracy / quality of products. Increased output / 24/7 working possible. Need for more highly skilled workers. Training for new/higher skilled jobs needed. New materials mean better products possible. New products can be designed and produced more quickly – rapid prototyping. High cost of new machinery and changes to factories.	<b>Level 3 (5-6 marks)</b> Thorough explanation, showing a clear understanding the impact of modern technologies on industrial production. Specialist terms and examples 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.  <b>Level 2 (3-4 marks)</b> Adequate explanation, showing some understanding of the impact of modern technologies on industrial production. There will be some use of specialist terms and examples, 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.  <b>Level 1 (1-2 marks)</b> Basic explanation, showing only limited understanding of the impact of modern technologies on industrial production. There will be little or no use of specialist terms or examples. Answers may be ambiguous, disorganised or 'list like'. Errors of grammar, punctuation and spelling may be intrusive. 0 - a response not worthy of a mark. Add 'Seen' at end of response.

Question			Answer	Marks	Guidance	
					Content	Levels of response
				6		<p>When marking 'Levels of response' questions, if answers are presented as a list of bullet points then award Level 1 maximum and specific mark, 1 or 2, dependent on quality of list.</p> <p>Do not apply ticks or annotations to 'Levels of response' questions.</p> <p>Mark these by reading all of the response, decide on an appropriate level, then a specific mark.</p>

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