OCR
Oxford Cambridge and RSA

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 2016

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Section A

Question			Answer	Mark	Guidance
1			**b**	1	Only acceptable answer.
2			**c**	1	Only acceptable answer.
3			**b**	1	Only acceptable answer.
4			**a**	1	Only acceptable answer.
5			**a**	1	Only acceptable answer.
6			Urea-formaldehyde, polyurethane, polyester, epoxy resin.	1	Any specific thermosetting plastic.
7			Disassembly.	1	Only acceptable answer.
8			Solar, wind, geothermal, tidal, hydro, bio/plant	1	Any appropriate response
9			Reduce	1	Only acceptable answer.
10			Disposable	1	Only acceptable answer.
11			Biofuel is non-renewable	1	False
12			All products that use recycled materials are poor quality	1	False
13			Carbon offsetting helps to reduce a company's carbon footprint	1	True
14			Fairtrade is not sustainable in the long term	1	False
15			CFCs help protect the ozone layer	1	False
			Total	15	

Question			Answer	Mark	Guidance
16	(a)	(i)	Zero carbon emissions so air quality improves considerably in urban areas. Less fossil fuels need to be extracted, which causes less damage to the environment. Reduced global warming (1)	2	2 marks for a justified response.
		(ii)	Electric cars have a limited range compared to a traditional petrol/diesel car making longer journeys more difficult/less suited to rural areas. Electric chargers not readily available in many areas, compared to regular fuel stations (1).	2	2 marks for a justified response.
16	(b)		Aluminium alloy can be recycled saving raw materials. Aluminium alloy is corrosion resistant and so will contribute to a longer lasting car which reduces material and energy use. Aluminium alloy is light helping to reduce running costs by improving fuel consumption of the vehicle	4	Two marks for each justified response (2 x 2)

Question			Answer	Marks	Guidance	
					Content	Levels of response
16	(c)*		Up to six marks for a discussion or detailed explanation of the reasons why sustainable energy sources are being developed.		Discussion to revolve around the fact that finite energy resources such as coal, gas and oil are depleting. Therefore, alternative energy supplies are being developed to reduce dependence upon them, and to preserve them for other uses such as making plastics. Furthermore, use of fossil fuels is harming the environment and making a major contribution to global warming. Alternative energy use will help reduce carbon emissions and slow down or eliminate the consequences of global warming Fossil fuel extraction is reduced, as well as transport of oil to refineries etc. Pollution during processing from raw material such as oil and coal is also eliminated. Finite fossil fuels are preserved for the future. Companies may be responding to government legislation. Companies may want to promote a green image of their company and try to capture	**Level 3 (5-6 marks)** Thorough **discussion,** with appropriate examples, showing a good understanding of the issues. There will be a range of 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. **Level 2 (3-4 marks)** Adequate **discussion**, with examples given, 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 **Level 1 (1-2 marks)** Basic **discussion**, showing some understanding of the issues. There will be little or no use of specialist terms or examples may be inappropriate. Answers may be ambiguous or 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 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.

Question			Answer	Marks	Guidance	
					Content	**Levels of response**
				6	sales from consumers who wish to purchase green products.	Do not apply ticks or annotations to 'Levels of response' questions. Mark these by reading all the answer, decide on an appropriate level, then a specific mark.

Question			Answer	Marks	Guidance
16	**(d)**		1 mark for appropriate named material – aluminium alloy, polypropylene, mild steel. 1 mark for appropriate design of a functioning bracket that would hold the cable. 1 mark for indicating a minimum usage of material. 1 mark for sketch or label referring to method of attachment. (4x1)	**4**	Any named appropriate material. Bracket using a limited amount of material.
16	**(e)**		Up to two marks for a relevant explanation Example: The presence of the symbol will facilitate material identification for ease of recycling (1) – thus preventing contamination of dissimilar materials (1). For example mixing thermoset with a recyclable thermoplastic. (2x1)	**2**	Up to two marks for a justified response.
			Total	**20**	

Section B

Question			Answer	Mark	Guidance
17	**(a)**		Cutting a vacuum formed shape out of a sheet of ABS: Tool **B** Tinsnips/hand shears Cutting a screw thread on a round mild steel bar: Tool **D** (split circular) die Cutting through a piece of 3mm diameter brass rod ; Tool **E** Junior hacksaw 2 x (1+1)	**6**	Allow ecf for correct name of incorrectly chosen tool
	(b)	**(i)**	**Alloys :-** Brass; Bronze; Cast iron; Mild steel; High speed steel (2x1)	**2**	
		(ii)	**Ferrous metals :-** Cast iron; Mild steel; High speed steel (2x1)	**2**	
		(iii)	**Thermoplastics :-** polystyrene; acrylic; nylon (2x1)	**2**	
	(c)		One mark for example plus up to two further marks for a clear explanation Example: Childrens' toys are made from plastics rather than metals because they don't have such sharp edges and are safer for the child / are easier to make into awkward shapes than metals by using injection moulding 1+(2x1)	**3**	NOT 'cheaper than metal' Example *must* be given for full marks.
			Total	**15**	
18	**(a)**	**(i)**	**A** – Reciprocating motion **B** – Rotary motion (2x1)	**2**	Accept rotating / rotation but **not** circular
		(ii)	**X** - Cam	**1**	
		(iii)	**Y** – Worm and wormwheel	**1**	Accept 'worm drive' / worm gears

Question			Answer	Mark	Guidance
	(b)		Up to two marks for each clear description. Examples: Make the wormwheel with less teeth (or two start worm) so that it goes round more quickly. Double the number of lobes/rises on the cam so that it pushes the bar up twice on each turn. Increase the speed of the motor so that the wormwheel turns faster. 2 x (2x1)	**4**	Cause and effect required for two marks.
	(c)	**(i)**	**Stage 2** Mark positions of holes – try square and scriber, steel rule, **Stage 3** Mark centres of holes for drilling – centre/dot punch and hammer (4x1)	**4**	Both tools required at each stage
		(ii)	One mark for each of two appropriate reasons. Brass does not rust; it is easy to drill/cut; it can act as a 'bearing' for the sliding bar; it can be softened easily (2x1)	**2**	
		(iii)	Annealing	**1**	
			Total	**15**	

Question			Answer	Mark	Guidance
19	(a)		One mark for each of two valid reasons. HIPS is easily moulded into shape; it is available in many colours; it would be easily cleaned; it makes a strong and rigid tray (high impact) (2x1)	**2**	Not simply 'recyclable'
	(b)		Design could include/reference the following features: MDF/ wood/ styrofoam Draft angle on sides Rounded corners Vent holes Smooth surface One mark for each appropriate feature clearly shown/referenced (4x1)	**4**	
	(c)		One mark for each of three marks relevant benefits Examples: CAD allows changes to be made and saved easily. Designs can be sent electronically to other people. 3D views can be produced easily/quickly using a CAD package. CAD can be linked to CAM for prototype manufacture. Can be viewed through 360 degrees Can be tested through computer simulations (3x1)	**3**	

Question			Answer	Marks	Guidance	
					Content	Levels of response
19	(d)*		Up to six marks for a detailed explanation of the benefits to a manufacturer of using computer controlled machines and equipment.		Response may include consideration of the following points: Increased speed of production 24/7 working Less need for labour Safer working for workforce Removal of human error Consistent accuracy of products Ease of change-over of products Long term cost savings Quick Response Manufacturing	**Level 3 (5-6 marks)** Thorough explanation**,** showing a clear understanding of the benefits to a manufacturer of using computer controlled machines and equipment. 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. **Level 2 (3-4 marks)** Adequate explanation, showing some understanding of the benefits to a manufacturer of using computer controlled machines and equipment. 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 1 (1-2 marks)** Basic explanation, showing only limited understanding of the benefits to a manufacturer of using computer controlled machines and equipment. 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. 0 - a response not worthy of a mark. Add 'Seen' at end of response.

Question			Answer	Marks	Guidance	
					Content	Levels of response
				6		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. Do not apply ticks or annotations to 'Levels of response' questions. Mark these by reading all the answer, decide on an appropriate level, then a specific mark.
			Total for question	**15**		
			Total for paper	**80**		

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