

Design and Technology: Resistant Materials

General Certificate of Secondary Education

Unit **A562**: Sustainable Design

Mark Scheme for June 2011

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Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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Section A

Question		Expected Answers	Marks	Rationale
1		(a) Products are safe and fit for purpose	[1]	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
2		(c) The impact of human activities on the environment	[1]	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
3		(d) As environmentally friendly as possible	[1]	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
4		(a) Meets a safety standard	[1]	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
5		(d) Gas	[1]	Do not credit any other answer. No mark awarded if more than one answer ringed or the candidate response is not clear.
6		<p>Look for:</p> <ul style="list-style-type: none"> • Replacing parts of a product which no longer function correctly • Restoring a product to a workable condition after damage/decay/fault • Fix components so it can work • Fixing a broken product so you can continue to use it • Putting a product back together so it can work • Is mended/fixed <p style="text-align: right;">1 x 1 mark</p>	[1]	<p>Answer must be RM context, e.g. repairing a torn shirt = 0</p> <p>Answer must relate to product working again, not just updating or modifying it (fixing a product so it is more durable = 0)</p> <p>Do not accept: references to other meanings of the word repair (moving to, going, resorting to, etc.) repeat of the word "repair"</p>

Question	Expected Answers	Marks	Rationale
7	<p>Look for:</p> <ul style="list-style-type: none"> • Consumer will have to buy another product • Product can be made cheaper as it only has to last a certain length of time • Company can buy cheaper products if they only need to last a short(ish) time • Consumer will have to buy a replacement sooner than they would have liked • Manufacturer knows when to bring out a new product • Manufacturer will make more profit/more sold <p style="text-align: right;">1 x 1 mark</p>	[1]	<p>Do not accept: references to fashion, style, aesthetics; references to advantages to the consumer; one-word answers (e.g. cheaper/less expensive); quicker (to make); more efficient;</p>
8	<p>Recyclable steel Also accept: Recycle steel /recycling steel</p>	[1]	<p>Do not accept: references to magnetism; recyclable iron, ferrous, aluminium, metal (or metals other than steel) ‘Steel’ on its own</p>
9	<p>Look for:</p> <ul style="list-style-type: none"> • Decomposes/breaks down naturally in the ground • Products that rot naturally/over time • Products that are broken down by bacteria • Product breaks down without affecting the environment • Disintegrate into the ground • Rots/Rots away <p style="text-align: right;">1 x 1 mark</p>	[1]	<p>Do not accept: references to inorganic materials (plastics, metals)</p>

Question	Expected Answers	Marks	Rationale
10	Look for: <ul style="list-style-type: none"> • They damage/harm/destroy/make holes in the ozone layer • Difficult to dispose of the product safely • Cannot recycle product containing CFCs • Designers don't use CFCs; they will be linked with damaging product(s) <p style="text-align: right;">1 x 1 mark</p>	[1]	This is not a question about general or vague environmental issues Do not accept: references to toxicity, health hazard; bromine; references to cost; harmful to the environment/atmosphere; global warming references to CO2
11	False	[1]	Do not credit any other answer. No mark awarded if both answers flagged or the candidate response is not clear.
12	True	[1]	Do not credit any other answer. No mark awarded if both answers flagged or the candidate response is not clear.
13	True	[1]	Do not credit any other answer. No mark awarded if both answers flagged or the candidate response is not clear.
14	False	[1]	Do not credit any other answer. No mark awarded if both answers flagged or the candidate response is not clear.
15	True	[1]	Do not credit any other answer. No mark awarded if both answers flagged or the candidate response is not clear.
	Total	[15]	

Section B

Question		Expected Answers	Marks	Rationale
16	(a)	<p>Look for two technically different safety concerns</p> <ul style="list-style-type: none"> • Sharp edges • Small parts might fall off in use/shatter • Trapping fingers • The shade overheating and the possibility of fire • The shade overheating and melting/is it heat resistant? • Fittings must keep shade away from light bulb • Maximum wattage of light bulb must be displayed • Reference to burning hands <p style="text-align: right;">2 x 1 mark</p>	[2]	<p>Question requires some knowledge of polypropylene's properties</p> <p>Do not accept:</p> <p>references to other materials; references to cost, toxicity; weight, size, strength of flex; references to electrical connections; references to electrical conductivity; is it safe? will it fall apart? will it shatter? references to manufacturing process; references to the siting/fitting of the shade</p>
	(b)	<p>Look for flat-pack feature (1) leading to/following from environmental benefit (1)</p> <ul style="list-style-type: none"> • Less packaging (1) fewer trees cut down/less disposable waste (1) • Less fossil fuel used / lower carbon footprint (1) due to smaller packs and more on lorries (1) etc. • Less weight to transport/less packaging (1) therefore less fuel (1) used • Self assembly means fewer production processes (1) less energy used (1) – referring to either manufacturer or consumer • Smaller packages (1) therefore smaller warehouse (1) therefore less energy needed to build/heat/light storage facility (1) Max marks (2) • Flat pack product can fold flat for disposal (1) taking up less space (1) • Flat pack can be more easily disassembled (1) ready for recycling (1) <p style="text-align: right;">2 x 2 marks</p>	[4]	<p>Accept and credit: repeated flat pack feature e.g. 'less packaging' if qualified by different reasons</p> <p>Do not accept:</p> <p>references to cost of fuel or transport; references to cost of assembly; references to consumer or manufacturer UNLESS qualified by environmental argument; references to ease of getting the product home; references to lack of need for adhesives, fixings, solvents, etc.</p> <p>"less packaging therefore less weight" = 1</p> <p>Watch out for repeated benefits</p>

Question	Expected Answers	Marks	Rationale
(c)	<p>Look for either: Three statements or two statements and one corollary or one statement and two corollaries for a possible 3 marks</p> <ul style="list-style-type: none"> • Supply recycling instructions (1) • Add the recycling symbol (1) • Show the type of plastic from which the shade is made (1) • Offer incentives if product is returned (1) • Add warning of disadvantages of not recycling (1) • Add the recycling number (1) • Manufacturer supplies ideas for reuse (primary recycling) (1) • Add text to encourage recycling (1) <p style="text-align: right;">3 x 1 marks</p>	[3]	<p>Do not accept: references to using recycled/recyclable plastics; references to planned obsolescence</p> <p>Example: The lampshade may have a symbol on it which tells them it can be recycled (1). It may have other information which state how (1) it may be recycled. Also it may state how the product could be reused (1) for something else.</p>

Question	Expected Answers	Marks	Rationale
(d)	<p>Look first at which level – 1, 2 or 3 (basic, adequate, good) - is the best fit for the candidates' response, then use the information on general/specific points to fine tune the mark.</p> <p>Answers may refer to both thermoforming plastics and thermosetting plastics; ignore responses relating to the ozone layer.</p> <p>Look for:</p> <p>Landfill</p> <ul style="list-style-type: none"> • Most plastics do not biodegrade so they will be in the ground for ever • Landfill looks very unsightly while it is taking place • Landfill sites are filling up/becoming scarcer • Energy is needed to cover with soil etc when dumping is finished • Possible contamination of ground/water sources • Possible toxic products leaching into soil (e.g. copper from circuit boards) • Possible landfill settlement/subsidence causing dangerous depressions or sink holes • Takes up space which could be used for growing crops/trees • Long-term effects of burying plastics not known • Fuel is used to transport plastic to landfill • Possible choking hazard for wildlife <p>Incineration:</p> <ul style="list-style-type: none"> • Energy is needed to incinerate (but energy from burning can be used for other purposes) • Gases (SO₂, SO₃, CO, NO₂) pollute the air (acid rain) • CO₂ creates greenhouse effect/global warming • Smoke/soot (carbon) creates smog • Ashes still need to be disposed of <p>Disposal generally</p> <ul style="list-style-type: none"> • If plastics are not recycled, more oil will have to be used to make new plastics • Manufacture of new plastics gives off potentially harmful pollution/ greenhouse gases 	[6]	<p>This is about the impact that <i>disposal of plastics</i> has on the environment, not about recycling/reuse of plastics.</p> <p>Level 1 (0-2 marks) Basic discussion showing some understanding of how the plastics may be disposed of. There will be little or no use of specialist terms. Answers will be ambiguous and disorganised and there will be errors of grammar and punctuation. Spelling will be intrusive. Responses which present ideas only as simplistic bullet points cannot achieve Level 2 (therefore max. 2 marks)</p> <p>Level 2 (3-4 marks) Adequate discussion showing a reasonable understanding of how plastics could be disposed of. There will be some use of specialist terms. Answers will be reasonably clear and presented in a mainly structured format. There will be occasional errors of grammar, punctuation and spelling.</p> <p>Level 3 (5-6 marks) Thorough discussion showing clear understanding of how plastics would be disposed of. Specialist terms will be used appropriately and correctly. Answers will be clear and presented in a structured format. The candidate will demonstrate the accurate use of grammar, punctuation and spelling.</p>
	Total	[15]	

Question		Expected Answers	Marks	Rationale
17	(a)	<p>Look for two different reasons:</p> <ul style="list-style-type: none"> • Increased use of metal (1) – rapid production by pressing (1) • Improved durability (1) • Increased centralisation of production (1) – from village to town (1) • Less skill needed to manufacture (1) – no craft worker needed (1) • Fewer components required (1) – faster and cheaper to produce (1) • Rubber tyre (1) – easier to push/easier over bumps (1) • Rubber tyre (1) – less likely to rot (1) • Handles easier to grip (1) – enabling longer working time (1) • Modern materials (1) – encouraging sales to “techies” (1) • Thin metal construction (1) – lighter than wood (1) • Don’t get splinters from metal (1) <p style="text-align: right;">2 x 2 marks</p>	[4]	<p>This relates to evolution, not anthropometrics or recycling Tyre (B) can be either solid rubber or pneumatic. Do not accept: single-word answers (e.g. modern, light, cheap, strong, safe, etc.); references to looks/aesthetics; references to protection of materials; references to load-bearing capacities; references to cost; references to injection moulding of steel; references to strength of wood; references to puncturing</p>
	(b)	<p>Look for two different reasons:</p> <ul style="list-style-type: none"> • Increased use of plastic (1) – rapid production by moulding (1) • Plastic tray easier to adapt (1) by changing moulds (1) • Lighter than steel (1) therefore easier to push about (1) • Moulded handles (1) making them easier to grip (1) • Plastic component(s) don’t require protection/don’t rust (1) so last longer (1) • Rounded form of tray is easier to clean (1) • Plastic tray is “spoon-shaped”(1) and easier to empty (1) <p style="text-align: right;">2 x 2 marks</p>	[4]	<p>This relates to evolution, not anthropometrics or recycling Tray is a plastic moulding, and tyre (C) is pneumatic or solid Do not accept: single-word answers (e.g. modern, light, cheap, safe, etc.); references to looks; references to plastics forming methods; references to load-bearing capacities; references to cost; references to puncturing</p>

Question	Expected Answers	Marks	Rationale
(c)	<p>Look for two different reasons</p> <ul style="list-style-type: none"> • Moulded handles to fit your hand/improve grip/increase comfort • Much lighter than wood so easier to manoeuvre • (Plastic tray) easier to clean/tip/lift things out • Handles higher up/angled to make them easier to reach • Wooden handles could produce splinters/moulded handles are smoother • Rubber wheel allows easier use/comfort <p style="text-align: right;">2 x 1 mark</p>	[2]	<p>Accept: answers that imply a comparison with an all-steel barrow, even though direct reference is not made</p> <p>Do not accept: single-word answers e.g. light, strong, cheap (assumes confused by economics); references to strength/durability of materials; bigger tray so can move more; smaller wheel is not ergonomic!</p>
(d)	<p>Look for a point with any qualification for two marks:</p> <ul style="list-style-type: none"> • Tropical hardwoods are generally very slow to re-grow (1) reduced CO₂ absorption/O₂ production (1) • Deforestation of hardwoods (1) not a sustainable material (1) • Damage to the environment/rain forests (1) so loss of habitat (1) • Hardwoods generally heavier than softwoods (1) so less load can be carried in barrow (1) • Designer does not want to be associated with deforestation (1) puts off clients (1) • Long distance transportation uses (fossil) fuels (1) generates CO₂ (1) <p style="text-align: right;">2 marks</p>	[2]	<p>Do not accept: hardwood in short supply; hardwood difficult to work with/cut; not good for the environment (unless qualified); references to cost</p> <p>Sustainable = renewable in 50 years</p>
(e)	<p>Look for a qualified reason:</p> <ul style="list-style-type: none"> • Less waste – more environmentally friendly • Plastic can be strengthened by thickening at appropriate points in the mould • Greater variety of plastic types can be used • More flexibility of design of tray • Injection moulding is more accurate • Injection moulding is cheaper because it requires less trimming • Safer for operatives – not in direct contact with hot plastic sheets • Tray could be a stronger because of control of moulding thickness <p style="text-align: right;">1 mark</p>	[1]	<p>Do not accept: references to cost; single word answers e.g. light(er), quick(er); cheap(er), fast(er)</p> <p>references to anthropometrics or ergonomics; references to carbon emissions from plastic; saves energy; size of moulding</p>

Question		Expected Answers	Marks	Rationale
	(f)(i)	Look for reference to measurement: <ul style="list-style-type: none"> • (i) Length of user's arms/height of user (1) = (ii) handles (1) • (i) Size of hand/grip (1) = (ii) hand grips (1) • (i) Width of body/shoulders (1) = (ii) handles • (i) Length of stride (1) = (ii) space behind barrow tray (1) 		Do not accept: single word answers (arm, hand, grip, shoulders, height, grips, space); If f(i) = NR or 0 then f(ii) = 0 For 2 marks, f(ii) must match the response to f(i)
	f(ii)		1x1 mark 1x1 mark	
Total			[15]	

Question		Expected Answers	Marks	Rationale
18	(a)	<p>Look for reference to peoples (1), their beliefs/relationships/religion/traditions/art (1) exemplified by the hardwood pendant (1)</p> <ul style="list-style-type: none"> • Decoration based upon tribal face/body art transferred/translated to “western” tastes using stylised patterns • Tropical hardwoods can be highly figured/grained and require little in the way of extra colour such as precious stones which would generally not be available to small, isolated cultures • Tropical hardwoods grow in areas where small tribes live, work and hunt and are readily available to the local craftspeople who would use their local customs to decorate the medium • Some cultures such as Islam use geometric designs to decorate buildings in vibrant colours • People who support that culture will buy products based upon that culture • It’s a religious symbol showing other people that the wearer is religious <p style="text-align: right;">3 x 1 mark</p>	[3]	<p>This is not about designing in the “west” and targeting an ethnic audience</p> <p>Do not accept: design is culturally based (TV); design is intended as a souvenir of a trip to a tropical country; tribes don’t have modern products but do like jewellery;</p>
	(b)	<p>Look for:</p> <ul style="list-style-type: none"> • Shape or form • Colour • Texture/finish • Feel/touch • Pattern or design • Looks/appearance <p style="text-align: right;">3 x 1 mark</p>	[3]	<p>Accept qualified terms such as: symmetrical, rounded, smooth, style</p> <p>Do not accept: references to size or weight; references to “material(s)”; repeated answers (e.g. Texture and Finish)</p>

Question		Expected Answers	Marks	Rationale
	(c)	<p>Look for:</p> <ul style="list-style-type: none"> • Minimum level of pay • Maximum working hours • Entitlement to breaks • Entitlement to Holidays • Maternity leave • Minimum age of workers • Freedom to choose employment • Freedom to join trade union • Safe working conditions • Provision of appropriate safety equipment • Hygienic working conditions e.g. clean water • No discrimination • Provision of regular employment • Fair treatment/no abuse of/respect for workers • Entitlement to appropriate training <p style="text-align: right;">Any 4 x 1 mark</p>	[4]	<p>Accept only one reference to specific safety features (goggles, machine guards, protective clothing, etc.; this is HSE)</p> <p>Do not accept: fair trade</p> <p>single-word answers (safety, hygienic)</p>
	(d)	<p>Look for:</p> <ul style="list-style-type: none"> • Assessment of the severity of the injury • Assessment of the likelihood of the accident • Identify/check for the hazards/dangers/risks • Decide who might be harmed and how • Evaluate the risks and decide on precaution • Record your findings and implement them • Review your assessment and update if necessary <p style="text-align: right;">2 x 1 mark</p>	[2]	<p>This is not about the product and its risks (sharp edges, breakable...)</p> <p>Do not accept: (is it) safe? "the risk"; references to the product itself (e.g. is it toxic/dangerous);</p>
	(e) (i)	<ul style="list-style-type: none"> • <u>European Eco-label</u> • <u>EU Eco Label</u> • <u>European Eco logo</u> • <u>EU Eco logo</u> <p>(must have all three parts for mark)</p> <p style="text-align: right;">1 mark</p>	[1]	<p>Do not accept: European Standards; made in Europe; eco-friendly label; environmentally friendly Conformité Européenne label</p>

Question		Expected Answers	Marks	Rationale
	(ii)	<p>Look for: [The consumer knows that ...]</p> <ul style="list-style-type: none"> ... products with this mark will have a smaller environmental impact (1) than other similar products (1) ... they can easily take environmental concerns (1) into account when shopping (1) ... the products are made in a way (1) to avoid detrimental effects on the environment (1) high performance (1) and environmental quality (1) (DEFRA) <p>“Shows [the consumer] that ... “ might be a good start, and can be implied 2 x 1 mark</p>	[2]	<p>We are not looking for a definition of the EU label.</p> <p>Do not accept: references to any other labelling system e.g. Fairtrade, CE label, FSC, etc.; references to food packaging; eco-friendly unless qualified; it's of a good standard; shows where it was made; less energy used to transport it as it was made in Europe; has met government safety standards</p>
Total			[15]	

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