

# **Design and Technology**

General Certificate of Secondary Education

Unit **A512** Electronics and Control Systems: Sustainable Design

## **Mark Scheme for June 2013**

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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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Question		Answer	Marks	Guidance
1		b	1	
2		d	1	
3		a	1	
4		c	1	
5		d	1	
6		Chloro-Fluoro-Carbon or Chlorofluorocarbon	1	allow misspelling so long as meaning is clear
7		<ul style="list-style-type: none"> <li>• plastic can be re-used, (including re-processed into different things)</li> <li>• burnt to recover energy embodied</li> <li>• because it does not decay in environment</li> <li>• it can help reduces consumption of finite resources</li> <li>• eg uses less oil.</li> </ul>	1	Any valid environmentally beneficial reason but not a generic catch-all like "saves waste"
8		<ul style="list-style-type: none"> <li>• water is non-hazardous/non-toxic/not harmful.</li> </ul> or <ul style="list-style-type: none"> <li>• organic solvents are harmful to humans/ environment/ozone layer.</li> </ul>	1	Not "cost" based
9		Anthropometric (allow "Ergonomic") data/tables	1	accept alternative spellings, but not 'the look'
10		Repair	1	Only
11		False	1	
12		True	1	

Question		Answer	Marks	Guidance
13		True	1	
14		False	1	
15		False	1	
		<b>Total</b>	<b>15</b>	

## SECTION B

Question		Answer	Marks	Guidance
16	(a)	<p>Any 4 of:</p> <ul style="list-style-type: none"> <li>• securely holds the phone eg snap-in or velcro type retention</li> <li>• allows power cable to plug in</li> <li>• ideal angle for the driver to view</li> <li>• heat resistant/uv resistant as it will sit in sunshine</li> <li>• folds flat/flat-packable for storage</li> <li>• slots securely into recess in car so it can't move under braking/cornering/acceleration</li> <li>• made of recyclable plastic.</li> </ul>	4	Watch for re-phrased repetition/saying the same thing twice but differently.
	(b)	<ul style="list-style-type: none"> <li>• no physical product needs delivering (or collecting) by saving on transport costs.</li> <li>• increases lifespan of the product by maintaining functionality by preventing built-in obsolescence from rendering the device useable</li> <li>• no cd needs to be produced so no raw materials consumed.</li> </ul>	2	Benefit stated/explanation

Question	Answer	Marks	Guidance
(c)	<ul style="list-style-type: none"> <li>• the holder needs to fit a specific (or generic) phone so it can still be plugged in for charging</li> <li>• designer would have researched specific/generic mobile phone sizes</li> <li>• it needs to be clearly visible to the driver</li> <li>• without restricting their view of the road</li> <li>• measurements inside the car from the driver's viewpoint</li> <li>• internal sizes of the car would have been researched</li> <li>• reference would have been made to ergonomic/anthropometric data for human male/female adults</li> <li>• so that the unit was compatible with at least 95% of the adult population.</li> </ul>	3	<p>Watch for re-phrased repetition/saying the same thing twice but differently.</p> <p>One reason well explained could achieve 3 marks as could 3 separate points</p>
(d)	<p>Any two of:</p> <ul style="list-style-type: none"> <li>• intensive use of the internal processor/graphics driver to constantly update the map</li> <li>• backlight on all the time</li> <li>• frequent data downloads from network to supplement positional calculations from database</li> <li>• powering the gps receiver continuously.</li> </ul>	2	Should be fairly clear-cut.

Question		Answer	Marks	Guidance	
	(e)	<p>One of:</p> <ul style="list-style-type: none"> <li>• plug-in solar electric panel that sits on the cars dashboard</li> <li>• description of an 'emergency' phone charger that uses a single aa cell (basically a joule thief as a commercial product) so long as reference to using either a rechargeable battery (previously recharged) or a 'flat' battery from eg a digital camera/games console control unit.</li> <li>• unusual ideas like wind powered charger that could clip to side window.</li> </ul>	1	Allow clip-on-to-the-window/sunroof wind powered generator. Don't allow 'from the car' it's used in the stem and is not very environmentally friendly.	
	(f)	<ul style="list-style-type: none"> <li>• by allowing the user to answer/control the phone:</li> <li>• without taking their eyes or hands off the task or road</li> <li>• allowing greater concentration on the task/driving/pedestrian hazards</li> <li>• not removing hands from controls to reach or touch the phone</li> <li>• which improves control and concentration</li> <li>• more like having a conversation with a co-worker/colleague.</li> </ul>	3	Organised explanation covering suitable points. May be general safety and concentration issues or more specifically related to use of mobile in a car. Watch for vague answers that say the same thing using different words.	
17	(a)	<ul style="list-style-type: none"> <li>• lower labour costs</li> <li>• less regulations about safety of factories</li> <li>• lax emissions regulations</li> <li>• greater flexibility and speed of manufacture possible than in traditional manufacturing centres.</li> </ul>	2	Any two	
	(b)	(i)	Globalisation is the internationalisation of products, labour and skills throughout the world.	1	International or global are key words

Question		Answer	Marks	Guidance
	(ii)	<p>Advantages: positive outcomes by bringing employment, income and prosperity to a previously poor area or reviving an abandoned area</p> <p>Disadvantages: manufacturers may take advantage of low labour costs and poor regulation to exploit workers (sweatshops) and/or produce a product without due care and consideration to the environment or their workers</p>	2	
	(c)	<p>Drawing and notes should, for full marks:</p> <ul style="list-style-type: none"> <li>• use all four of the offered parts groups</li> <li>• it should look as if it is fit for purpose</li> <li>• the led must be mounted to shine down or across the surface from above</li> <li>• it should capable of operating in a safe manner</li> <li>• with access to the dimmer control/switch</li> <li>• heat sink if used needs to be with the led.</li> </ul> <p>Even a basic design of flat base, upright stem and LED at a reasonable angle could score 3 marks.</p>	4	<p>Answers that just link the picture elements by lines perhaps the power supply to the control circuitry or direct to the LED only score 1 mark. If the candidate states that heat sink is NOT needed as LEDs are more efficient/cool running than halogens (ie justified) allow full marks if remainder of design is correct.</p> <p>Able candidates may well annotate and produce excellent drawings, scoring the maximum of 4 marks.</p>

Question		Answer	Marks	Guidance	
				Content	Levels of response
	(d)*	<p>Manufacturers should:</p> <ul style="list-style-type: none"> <li>• make attempts at minimising the power used during construction</li> <li>• use materials and processes with a greener credentials</li> <li>• give careful considerations to how they distribute their products</li> <li>• could use or produce green energy to operate their plants and factories. (google do make some attempt at greening their image by installing as many solar electric panels as possible).</li> </ul> <p>Equally consumers need to accept some responsibility by:</p> <ul style="list-style-type: none"> <li>• switching things off when not in use rather than using standby</li> <li>• repairing when possible rather than throwing away and re-cycling at end of life</li> <li>• refusing to buy non-green products</li> <li>• boycotting companies who harm the environment</li> <li>• lifestyle changes.</li> </ul>	6	<p>Able candidates will not have any difficulty finding threads to pursue in this question – making, use and lifestyle changes. Answers will likely follow this trend to some degree.</p> <p><b>Focus should be on reducing energy consumption</b></p>	<p><b>Level 3 (5–6 marks)</b> Thorough discussion, showing a good understanding of how ‘greening’ might be achieved. 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 discussion, showing a sound understanding of how ‘greening’ might be achieved. 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 discussion, showing some understanding of how ‘greening’ might be achieved. 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
18 (a)	<ul style="list-style-type: none"> <li>• does not use fossil/liquid fuel</li> <li>• which is costly and hard to obtain.</li> <li>• could be powered/charged by solar/wind</li> <li>• does not produce toxic fumes during use – so not poisoning the users</li> <li>• excellent light quality</li> <li>• prevents harm to eyesight due to poor light quality</li> <li>• maintenance free and exceptionally long life – so not expensive to maintain – no need for spare parts</li> <li>• safe low voltage circuitry with no naked lights</li> <li>• so no fire hazard due to combustion (of fossil fuels).</li> </ul>	6	<p>Any 3 related explanations based on an “advantage because”</p> <p>Needs some sort of justification or explanation to get two marks.</p> <p>“Information then action”</p> <p>Unqualified statements like ‘quick’ and ‘easy’ are not worthy of a mark</p>
(b)	<ul style="list-style-type: none"> <li>• provides clean power and light to the community</li> <li>• which replaces the harmful use of paraffin/kerosene – so improving general health and living/working environment</li> <li>• provides business opportunity for generating an income – from selling, installing and maintaining the systems and – creates local jobs</li> <li>• village becomes less reliant on external input such as fossil fuels and batteries for radios, phones etc.</li> <li>• improved quality of life for all involved in the chain, longer life span, opportunity for better education and self-improvement.</li> </ul>	3	<p>Any 3 “Benefit/result/outcome” statements.</p> <p>One reason well explained could achieve 3 marks as could 3 separate points or combinations of.</p>
(c)	<p>Literally a world-wide audience – bringing their activities to a wider audience</p> <p>Very low cost way of promoting their activities and so generating more funds for future developments</p>	1	

Question		Answer	Marks	Guidance
	(d) (i)	<ul style="list-style-type: none"> <li>• reduced electricity costs due to generating their own during daylight</li> <li>• tariff paid for each unit generated provides additional income</li> <li>• helping to reduce the carbon footprint of the home</li> <li>• system may export green electricity to the grid</li> <li>• improved awareness of power consumed.</li> </ul>	3	Any three
	(ii)	<ul style="list-style-type: none"> <li>• wind power</li> <li>• solar water heating</li> <li>• wave power</li> <li>• hep</li> <li>• bio-fuel (wood, crop waste or other net zero-carbon produce).</li> </ul>	2	
<b>Section B Total</b>			<b>45</b>	

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