

Design and Technology

General Certificate of Secondary Education

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

Mark Scheme for January 2012

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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		c	1	
3		c	1	
4		b	1	
5		b	1	
6		The "Recyclenow" logo, designed to encourage people to recycle.	1	Allow any reference to recycling.
7		Wind, wave, hydro-electric, solar (voltaic or heat), geothermal, tidal, biomass and plant material.	1	Not generic statements that lack some link to sustainability such as sun, human, kinetic/potential energy.
8		Aluminium	1	Allow for variations in spelling.
9		Refuse	1	
10		Given to a charity/friend for re-use, offered on Freecycle, sold, put on auction site.	1	Looking for 're-use' in some shape or form. Qualified such as return to maker, WEEE, dismantled at specialist plant. NOT just 'recycled'.
11		False	1	
12		True	1	
13		True	1	
14		False	1	
15		True	1	
Total			15	

Question	Answer	Marks	Guidance
16 (a)	<p>Any of: smaller (case), uses less materials, needs less packaging, better picture quality, uses less energy/power, receives freeview, can be used as PC/games console monitor, weighs less, HD ready, higher resolution, thinner, wall or cupboard mounted, more channels, better reception, more facilities, pause, rewind, record to usb, DVD/video player, uses less components, smaller components, separate speakers.</p> <p>Each justification should have some benefit credentials such as: less materials used to make, weighs less so lower transport costs, smaller so less packaging needed, easier to dismantle into component parts, one screen has several uses, reduction in CO2 due to lower power consumption, allow linked answers that cover multiple points possibly in 1 sentence.</p>	6	<p>1x6 marks Mark the three changes first, then look at validity of benefit. If reason is included in the change, allow 2 marks.</p>
(b)	<p>Glass – manually removed, re-cycled into any glass product, Painted/coated wooden frame, re-used in some way (e.g. simple furniture) or shredded for chipboard, composting or bio-fuel. Copper wire, separated from chassis, insulation removed, copper refined and re-used for wiring or plumbing, Large Plastic back panel, re-cycled as appropriate to plastic type or cleanly burnt to recover energy. Electronic components removed and re-used or processed separately to recover precious metals e.g. gold used in microchips and to prevent solder (lead) or other hazardous materials/metals entering the environment. Metals (generic), speakers, PCB's, aluminium (heat sinks)</p>	6	<p>Candidates should be able to specify any three of the many different materials and components used in building a TV. That part of the question is aimed at the lower grades. For the re-used part, expect a variety of unusual but feasible, realistic or reasonable suggestions. Watch for repetition (e.g. 're-cycle'). Recycled is appropriate only if qualified by what means or the outcome such as wine glass from tube, these responses are expected higher level answers. If a valid re-use such as 'to repair a faulty TV' or recycle into a toy.....'. Not 'flat screen' in LH column.</p>
(c)	<p>Wastes (electrical) energy, wastes electricity, wastes money, contributes to global warming.</p>	1	<p>Must clearly show knowledge that it wastes energy. Not 'may cause overheating'.</p>

Question		Answer	Marks	Guidance
	(d)	Disadvantage: Wastes energy (mains or battery), consumes resources (electronics/plastics/glass) in manufacture. Justified explanation such as operates when no one present, (24/7/365), consumes energy that causes global warming, CO2 emissions from use and manufacture, or left off most of the time due to concerns about consumption, thus wasting the resources used to make, package and distribute the display in the first place.	2	No credit for generic, vague reasons, must be 'environmental' reasons. Not 'cost'.
Total			15	

Question		Answer	Marks	Guidance
17	(a)	Charge indicator/charge complete light, speed control/timing/counting circuitry, sound when cleaning period over, variety of brush actions, ergonomic factors and references to product life cycle, on/off switch, grip, interchangeable heads.	3	3x1 Design points derived from the picture are allowed if valid, but not 'rechargeable' on it own. Durable, high quality, long life cell worthy of credit.
	(b)	Reduction in chemicals used in primary cell manufacture, lower net transport costs over lifetime of product, less need for re-cycling of dead cells, reduced risk of environmental pollution caused by cells being thrown out with household waste. Don't need throwing away, recharge instead.	2	Nothing to do with cost unless specifically related to consumption of resources related to the manufacture and distribution of PRIMARY cells that the rechargeable replaces.
	(c)	It means the whole working product has to be discarded/re-cycled even though the body, electronic, electrical and mechanical parts may have plenty of life remaining. Consumer has to buy a new unit. Not a sustainable design. Planned obsolescence	2	Weak reason/justification, 1 mark, 2 marks for a robust or well reasoned answer.
	(d)	Not suitable for under 3 years old, Green DOT, recycle	2	1x1 Allow reference to 'recycle' or any reference to the manufacturers contribution.

Question		Answer	Marks	Guidance
(e)	(i)	Children, (aged 3-16).	1	Aged not a requirement, but if candidate says for babies/children under 3 years, no credit. Allow 'deaf person'.
	(ii)	Encourages youngsters to brush teeth, entertains, times the brushing process, ensures teeth are brushed for the required time. Encourages children to brush, improve dental hygiene.	1	Allow references to benefits of an electronic toothbrush as per an adult version.
(f)		Any of: child friendly feature(s), such as grip, size, cartoon, brightly coloured or novelty feature e.g. branded toy, push button operation, touch/movement activated, sound or buzzer, splash/waterproof casing, drop proof, general features to make the product safe and useable, Buzzer, speaker for noises/music/tunes. Environmentally friendly features such as solar power, re-chargeable or replaceable larger cells (allowing for a longer product life), recycling information/logo for when product is worn out.	4	4x1 in any balance of answers allowed within the range 3:1 and 1:3, ie if only child friendly solutions are offered then 3 marks max, equally if only environmental solutions are offered then 3 marks max.
Total			15	

Question		Answer	Marks	Guidance
18	(a) (i)	Supply electricity to charge, (float charge) storage/battery/leisure battery, power electrical appliances / fridge / TV/PDA/MP3 player/laptop.	2	2x1, Must relate to, or involve electricity, ie this is NOT a solar hot water panel. If cooker or microwave is mentioned, no mark. If small fridge/food heater (e.g. Peltier effect) described, allow. Not vague like 'powers electrical/electronic things'. Use of electricity to preheat/heat water in limited amounts e.g. shower/washing up.
	(ii)	So that they receive maximum solar radiation, capture maximum solar emissions, get/produce maximum power from sun.	1	Allow "must be at 90 degrees to the sun", don't put in 'shadow'
	(b)	Description of the relatively high capital cost compared to the low instantaneous yield of energy, but easy payback over the product lifetime.	2	Weak reason/justification, 1 mark, 2 marks for a robust or well reasoned answer.

Question		Answer	Marks	Guidance
	(c)	The process by which waste materials are re-cycled into different types of products by breaking / dismantling into the basic materials which can then be re-manufactured.	2	2x1 Can include re-use of electronic components or the re-use of packaging or casing material of the product. Key concept is 'the materials are re-used in manufacturing'.

Question	Answer	Marks	Guidance
(d)	To prevent potentially hazardous or valuable metals used in electronics, (cadmium, beryllium, lead, tin, gold, silver) going to waste, often mixed in with materials which benefit from manual separation prior to industrial process.	2	Weak reason/justification, 1 mark, 2 marks for a robust or well reasoned answer. Does not have to include both hazardous and valuable in answer for 2 marks
(e)*	<p>Looking for: Comments and discussion centred around our increasingly 'must have' culture, (typically the 'Free' upgrades every 12/18 months or similar, whether needed or not that mobile phone companies offer) where a new generation of similar or combined products compete in the market place, largely driven by consumerism rather than any real human need or benefit offered by the new product.</p> <p>"Electronics and consumer electronics" are the key here, disposal or consumption.</p> <p>List-like like answers should not score higher than L1, 2 marks.</p>	6	<p>TO BE ADDED TO IN THE LIGHT OF CANDIDATE RESPONSES</p> <p>6X1-</p> <p>Level 1: (0 – 2 marks) Basic discussion, showing some understanding of how technological innovation can drive consumerism. 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> <p>Level 2: (3 – 4 marks) Adequate discussion, showing some understanding of how technological innovation can drive consumerism. 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>Level 3: (5 – 6 marks) Thorough discussion, showing some understanding of how technological innovation can drive consumerism. There will be three of 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>TO BE ADDED TO IN LIGHT OF CANDIDATES RESPONSES</p>
	Total	15	
	Paper Total	60	

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