

Design and Technology

General Certificate of Secondary Education

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

Mark Scheme for January 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	Additional Guidance
1	(c)	[1]	
2	(b)	[1]	
3	(b)	[1]	
4	(d)	[1]	
5	(c)	[1]	
6	Item should not be placed in (domestic waste) bin, not intended for landfill	[1]	Reason stated. Not 'recycle'
7	Wind, wave, hydro-electric, solar (voltaic or heat), geothermal, tidal	[1]	Not water alone
8	Health and Safety	[1]	
9	Use less of a product, material or resource in their work, design, packaging	[1]	Allow reduction in concept of parts, materials, packaging
10	One of compost, wood-chips, mulch, soil conditioner, weed suppressant, firewood.	[1]	Not paper, or manufactured board
11	False	[1]	
12	True	[1]	
13	True	[1]	
14	False	[1]	
15	False	[1]	
	Section A Total	[15]	

SECTION B

Question		Expected Answers	Marks	Additional Guidance
16	(a)	Single person, elderly/infirm/disabled person, camping/caravan/marine user, flat dweller, holiday maker, in a hotel room, student, people on a budget.	[1]	Not family, home
	(b)	Any of less financial outlay/cheaper to buy, fewer resources used in making, transporting or using the kettle. Cheaper material. Easier to lift, boils smaller amounts of water (so saving energy). Plastic is an insulator, handle won't get hot, less storage space required, more ergonomic grip. Clearly labelled water gauge, lighter, not as heavy, easier for elderly to lift/hold.	[2]	Not quicker to boil
	(c)	During use (for boiling water).	[1]	
	(d)	Less energy used than eg rotational moulding with relatively low energy input (heating plastic only) and very little waste which can be easily re-used or recycled.	[2]	Must be qualified, not 'recyclable' but 'product can be recycled'
	(e)	<p>Advantage – product could literally last a lifetime / long-lasting / solid, resists knocks, does not corrode or degrade like plastics, not using oil based resource.</p> <p>Disadvantage – costly metals used in alloy (chromium and nickel), hard to fabricate and assemble, slow to polish for desired finish, labour and energy intensive during manufacture, heavy to distribute/transport.</p> <p>High conductivity leads to loss of heat, danger of burns, production pollution issues, takes a long time to biodegrade.</p>	[1] [1]	
	(f)	Educate users not to over-fill kettle / provide a measuring jug to encourage sensible filling / add a sight gauge graduated in cups and mugs / make sure it switches off as soon as kettle boils, reference to improved insulation properties or feature like thermos jug concept. Thermos jug used to store (hot) water for later.	[2]	Show awareness of energy wasted by protracted boiling

Question	Expected Answers	Marks	Additional Guidance
(g)(i)	Advantage for end user – no cord to unplug (so less danger of shock) no trailing wire hampering pouring or impeding those with a weak grip (elderly/infirm – easy to lift from base) no cable dragging behind kettle, do not need to unplug to fill, faster/ easier to use if justified, lead length adjustable, easy to store, shorter lead may not hang over worktop edge for children to pull/touch – H&S, any justified H&S reason.	[1]	Justified answer
(ii)	Advantage for manufacturer – less/shorter cable, (less materials) needed so cheaper to make, easier to pack with a shorter cable, modern product, complimentary design, less to replace if kettle or base failed under guarantee. Same base could be used with different kettle designs. Minimal assembly required during manufacture, simple to make.	[1]	Justified answer
(h)	Relating to the premature demise of an otherwise sound product such as: waste of materials energy used in manufacture cost to consumer damaging to the environment (carbon footprint, increased transport) squandering of resources (energy used, co2, toxic emissions).	[3]	Environmental concept Justified answer
	Total Question 16	[15]	

Question		Expected Answers	Marks	Additional Guidance
17	(a)	Vibrate alert, make a noise (or different noises including 'talk') when time interval is over, logical button layout, Braille or tactile, different sounds for button, simple button system (not too many), easy to replace battery, low battery indicator, announcements as time passes eg every minute announced, loud enough, must be usable by carer. Voice activated.	[4]	Point should relate to the needs of the visually handicapped
	(b)	Primary cells use up chemicals as electricity is used and are not rechargeable (allow 'not rechargeable'). Should be recycled at end of life. Secondary cells may be recharged (up to 1,000 times) offering significant benefits in running costs and environmental impact. (allow 'rechargeable'). Should be clear distinction for 2 marks.	[1] [1]	
	(c)	Feature should be specific to disability – restricted hearing. Add a light (that could flash) Add a vibration alert (like on mobile phones) Large visual element – display/ bright light Allow design improvements such as rounded corners (won't dig in pocket if carried around because it won't be heard, wrist strap/belt clip, technology like Bluetooth enabled to link to existing mobile phone, loop technology.	[4]	
	(d)	Any of solar panel, wind-up, wind clockwork clockwork-generator or winder-generator-battery/cell/super capacitor (allow capacitor if mentioned as storage), squeeze-action generator, shake (up and down) action, pull-the-string to wind.	[2]	Not windmill or rechargeable cells
	(e)	The three aims are stated as: re-use, re-cycle and recover it, from the EA website. All three concepts should be covered for 3 marks. Allow reference to repair (so allowing re-use).	[1] [1] [1]	Understanding of the concepts of WEEE – preventing toxic material entering landfill/anywhere it should not go
		Total Question 17	[15]	

Question	Expected Answers	Marks	Additional Guidance
18 (a)	Any three of monitor power (consumed daily) See cost of power See what individual products use – which products to replace with more efficient versions Use less / investigate wasted energy from use of products on standby / raise awareness and understanding compare efficiency of different products, help with budgeting, alert if threshold exceeded.	[1] [1] [1]	3 clear concepts covered for 3 marks. Watch for the same thing written differently
(b)	Any two of: to prevent shock – on removal from socket, especially if small fingers were to be wrapped around. Prevent short circuit by intentional abuse.	[1] [1]	
(c)	(i) Any of recycle, reuse or reduce, (ii) Can be shaped to protect contents, excellent impact resistance, holds object inside an outer container (box), reduces transport cost as lightweight, water resistant, recyclable, light(weight).	[1] [1] [1] [1]	With justified use
(d)	Consumers could: Physically turn off appliances All-off remote /master shut-off Energy monitoring units Power-saver sockets Fridges etc) hardware / software could be modified to encourage power saving such as sleep / snooze / screensavers or messages when a product is fully charged or switched off by remote control. Respond to information about potential energy savings (included with product). Environmental grading of efficiency A-G, Cost of energy used during lifetime (an awareness), Product upgradable, repairable, Changing light bulbs, Buy from company with good eco-credentials/takes part in carbon offsetting Use green energy, reduce usage of powered products Give products away / freecycle / buy local Environmental impact of purchase, usage and end of life.		Answers which discuss a range of end of life issues are acceptable such as separation of components for safe disposal/recycling issues, re-use of parts

Question	Expected Answers	Marks	Additional Guidance
	<p>Embodied in:</p> <p>Level 1 (0-2 marks) Basic description, showing some understanding of the power or energy consumed or saved and means to address it. 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 description, showing an understanding of the power or energy consumed or saved and means to address it. 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 description, showing clear of the power or energy consumed or saved and manes to address it. 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>	[6]	List like answers score 2 maximum
	Total Question 18	[15]	
	Total Section B	[45]	
	Total Paper	[60]	

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