

GCSE

Design and Technology: Electronics and Control Systems

Unit **A515/01**: Sustainability and technical aspects of designing and making electronics

General Certificate of Secondary Education

Mark Scheme for June 2017

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

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.

© OCR 2017

Annotations

Annotation	Meaning
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	Level 1
	Level 2
	Level 3
	Noted but no credit given
	Tick

SECTION A

Question		Answer	Mark	Guidance
1		A	1	
2		A	1	
3		B	1	
4		D	1	
5		A	1	
6		Reduction in the amount of waste materials	1	Allow other valid responses related to less environmental pollution.
7		Reduction in emissions of carbon dioxide or greenhouse gases made in order to compensate for an emission made elsewhere.	1	
8		<ul style="list-style-type: none"> • Use less energy / power • Last longer • Easier recycling process and less waste 	1	
9		<ul style="list-style-type: none"> • The colour red is often used in warning and hazard signs • It symbolises danger • It stands out against other colours • It is a very visible colour in daylight 	1	
10		Refuse	1	
11		True	1	
12		True	1	
13		False	1	
14		False	1	
15		False	1	

Question		Answer	Marks	Guidance
16	(a)	<p>Any of the following:</p> <ul style="list-style-type: none"> • Spring loaded • Quick lock and release button - allow 'control button' • Comfortable (ergonomic) handle • Flexible lead • Clip is attached easily to dog's collar. • Durable / tough plastic case <p style="text-align: right;">3 x 1 marks</p>	3	<p>Accept any other valid response.</p> <p>Do not allow 'extendable', 'portable' or 'ergonomic' with no link to a feature.</p>
	(b)	<ul style="list-style-type: none"> • Batteries have limited life / need to be replaced • No harm to the environment • No batteries to dispose of • No additional expense e.g. battery disposal <p style="text-align: right;">2 x 1 marks</p>	2	Accept any two answers or other valid response
	(c)	<p>Simple statement e.g: its properties can change. (Does not state how the change is triggered) 1 mark.</p> <p>A material whereby its properties can be changed by external stimuli, such as stress, temperature, moisture, pH, electric or magnetic fields, 1 mark</p>	2	
	(d)	<p>Both features included in the redesign 2 x 1 mark</p> <p>Specific materials identified 1 mark</p> <p>Components identified 1 mark</p> <p>Helpful annotation to explain thinking 1 mark</p>	5	

Question		Answer	Marks	Guidance
	(e)	<ul style="list-style-type: none"> • Low cost to manufacture • Easy to work / shape / form • Can be recycled / made from recycled materials • Biodegradable • Print directly to surface / decorate • Protect contents • Durable / strong • Lightweight and easy to transport <p style="text-align: right;">2 x 1 marks</p>	2	

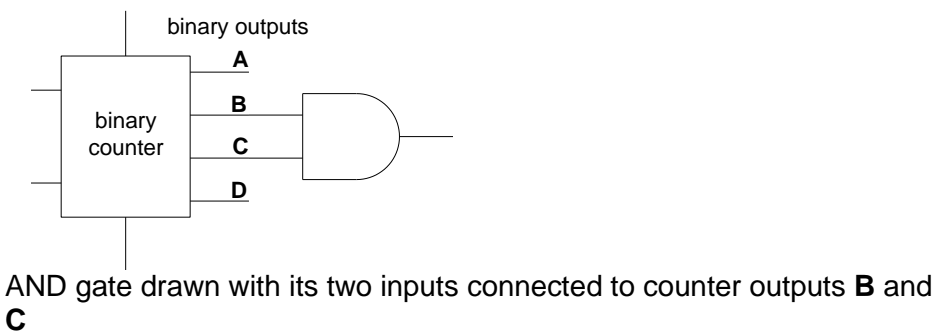
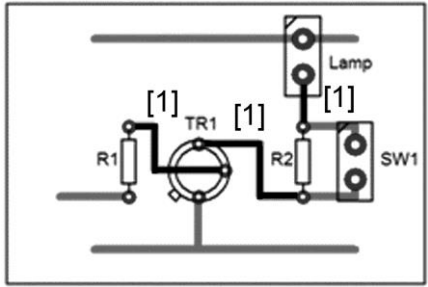
Question		Answer	Marks	Guidance	
				Content	Levels of response
	(f)*	<p><u>Advantages</u></p> <ul style="list-style-type: none"> • Improved living standards • Increase in public health benefits • Interconnected nations share best practice. Kyoto Protocol, for example. • Larger markets, create more jobs • Ease of internet purchase <p><u>Disadvantages</u></p> <ul style="list-style-type: none"> • Worldwide shortages of finite materials • Worker exploitation (ETI) • Increased energy consumption • impact on carbon footprint • transportation impact 			<p>Level 3 (5-6 marks) Thorough explanation, with examples, showing a clear understanding of how globalisation affects the environment. There may 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> <p>Level 2 (3-4 marks) Adequate explanation, possibly with examples, showing a sound understanding of how globalisation affects the environment. There will be some use of specialist terms, although these may not always be used appropriately. The information will be presented</p>

		<ul style="list-style-type: none"> • toxic waste in relation to production & manufacture • Changes to social and spiritual well being • Spread of human, animal and plant diseases 	[6]	<p>for the most part in a structured format. There may be occasional errors in spelling, grammar and punctuation.</p> <p>Level 1 (1-2 marks) Basic explanation, possibly without examples, showing some understanding of how globalisation affects the environment. 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>(0) Response worthy of no marks.</p>
		TOTAL	[15]	

SECTION B

Question			Answer	Mark	Guidance
17	(a)	(i)	8mm	[1]	
		(ii)	<ul style="list-style-type: none"> Description of how hole centre could be marked on panel 1 mark e.g. Scriber, marker pen, masking tape and pencil Description of use of centre punch before drilling 1 mark 	[2]	Tools must be named for full marks
		(iii)	<p>Manufacturing precaution to achieve a high quality drilled hole 1 mark</p> <p>Explanation of how the precaution helps 1 mark e.g.</p> <ul style="list-style-type: none"> Clamp workpiece to avoid damage Use sacrificial backing piece to reduce burrs Feed slowly to reduce burrs Start with small drill then enlarge to ensure correct centring 	[2]	
		(iv)	<p>Bezel shown correctly in hole 1 mark</p> <p>Split washer beneath panel 1 mark</p> <p>M8 nut below split washer 1 mark</p>	[3]	Allow marks if bezel is not assembled but understanding is shown of the process to assemble on the panel
	(b)	(i)	<p>Any two valid reasons, e.g.</p> <ul style="list-style-type: none"> Different colours help identify LEDs/polarity All wires neatly joined into a single cable Cable can be 'zipped' down to width required Flexible stranded wire used 	[2]	
		(ii)	<p>Wires shown attached to each leg 1 mark</p> <p>Suitable method of preventing short circuit 1 mark e.g. wires soldered on and heat shrink sleeving used</p>	[2]	Allow mark for heat shrink even if no referent to soldering
	(c)		<p>Named method e.g. tool/equipment 1 mark</p> <p>Description of how the method achieves accuracy in line 1 mark</p> <p>How method achieves repeatability over 20 panels 1 mark</p>	[3]	

		e.g. <ul style="list-style-type: none">• Use of CNC drilling/routing machine• Use of template• Use of drilling jig		
			Total	[15]

Question			Answer	Mark	Guidance					
18	(a)	(i)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 5px;">3</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">1</td> </tr> </table>	3	0	0	1	1	[1]	Both cells correct for 1 mark
3	0	0	1	1						
		(ii)	 <p>AND gate drawn with its two inputs connected to counter outputs B and C</p>	[1]						
	(b)	(i)	<p>Total resistance with SW1 open = 120 + 47 = 167 ohms $I = V/R = 12 / 167$ $I = 0.072 \text{ A (72mA)}$</p>	[3]	Allow two marks max for the answer 0.255A (12/47)					
		(ii)	The lamp will be brighter with SW1 closed	[1]						
		(iii)	 <p>1 mark for each missing track</p>	[3]	Credit any alternative, correct routing. Collector can go to either end of R2, but lamp must then go to the opposite end of R2					

Question		Answer	Marks	Levels of response
	(c)*	<p>Discussion should include some but not all of the following points:</p> <p>Advantages:</p> <ul style="list-style-type: none"> • Sustainability – no waste batteries • Free energy • No mains wires need to be run to product • Clean energy – no pollution • No maintenance – no batteries to change <p>Disadvantages:</p> <ul style="list-style-type: none"> • Initial cost • No energy at night • Reduced energy on cloudy days • Limited power/current available • Difficult to mount/large • Chemicals/energy used in panel manufacture 	[6]	<p>Level 3 (5-6 marks) Shows detailed understanding of benefits and drawbacks of solar panels. Suitable examples used. Specialist terms will be used appropriately and correctly. The information will be presented in a structured format. The candidate can demonstrate the accurate use of spelling, punctuation and grammar.</p> <p>Level 2 (3-4 marks) Shows some understanding of benefits and drawbacks of solar panels. 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, punctuation and grammar.</p> <p>Level 1 (1-2marks) Shows understanding of benefits and drawbacks of solar panels. No examples used. There will be little or no use of specialist terms. Answers may be ambiguous or disorganised. Errors of grammar, punctuation and spelling may be intrusive.</p> <p>0 Response worthy of no marks.</p>
		TOTAL	[15]	

Question		Answer	Mark	Guidance
19	(a)	<p>Valid warning label e.g.</p> <ul style="list-style-type: none"> • Battery (flammable) warning • not suitable for children (small parts) • moving parts • do not cover • laser / radiation <p>Valid information label e.g.</p> <ul style="list-style-type: none"> • any control marking (on/off, tone etc.) • battery type / polarity indication • mounting point • BSI/CE marking • RoHS • Disposal / recycling info • Double insulation • WEEE • PAT 	[2]	<p>Credit sketches of any valid labels 2 x 1 marks</p> <p>Not high voltage</p> <p>Accept other viable answers</p>
	(b)	(i)		
		<p>Amplifier module increases the level of the audio signal to drive the loudspeaker Allow:</p> <ul style="list-style-type: none"> • makes speaker louder • allows sound to be heard • makes signal / voltage / current bigger 	[1]	Allow any other valid response
		(ii)		
		Module C	[1]	
		(iii)		
		<p>One valid reason for choice e.g.</p> <ul style="list-style-type: none"> • Stereo is not needed – only mono • A supply voltage of 12V (or 6V or 9V) is easily attainable • The highest power (50W) will be needed so the sound can be heard outdoors 	[1]	<p>Award mark for a valid reason even if (b)(ii) is incorrect</p> <p>Do NOT credit reference to cost</p>

		(iv)	Steel will rust (oxidise) if left outdoors	[1]	
		(v)	Any suitable method stated e.g. <ul style="list-style-type: none"> • apply paint • galvanise • powder (plastic) coat • Electroplate 	[1]	
	(c)	(i)	Suitable plastic 1 mark e.g. <ul style="list-style-type: none"> • HIPS • ABS • Acrylic • Polyester • polypropylene Two relevant properties identified <ul style="list-style-type: none"> • can be softened and formed • can be drilled/cut • available in thin sheets • self-finished • good aesthetic finish • suitable for use outdoors • resistant to water • electrical insulator <p style="text-align: right;">2 x 1 mark</p>	[3]	Do NOT credit reference to cost (cheap) unless explained Allow other suitable property related to the plastic
		(ii)	Shape of former reflects shape of box – 3D or side view 1 mark Former drawn with widest face at bottom 1 mark One feature identified 1 mark e.g. <ul style="list-style-type: none"> • rounded edges • draft angle 	[3]	The quality of sketch will need to be good enough to make the shape and orientation clear for the award of the first two marks.

			<ul style="list-style-type: none"> • mould release applied to surface • no undercuts 		
	(d)		<p>Identifying a relevant property 1 mark Explaining how the property can be useful in a product 1 mark e.g. QTC – resistance drops sharply when squeezed – useful for switches in textile products SMA – returns to programmed shape when heated – useful in medical applications e.g. dental braces Thermochromic – colour changes (disappears) above a certain temperature – useful in signs to warn of hot objects</p>	[2]	NO credit for naming the smart material
			Total	[15]	

OCR (Oxford Cambridge and RSA Examinations)
1 Hills Road
Cambridge
CB1 2EU

OCR Customer Contact Centre

Education and Learning

Telephone: 01223 553998

Facsimile: 01223 552627

Email: general.qualifications@ocr.org.uk

www.ocr.org.uk

For staff training purposes and as part of our quality assurance programme your call may be recorded or monitored

Oxford Cambridge and RSA Examinations
is a Company Limited by Guarantee
Registered in England
Registered Office; 1 Hills Road, Cambridge, CB1 2EU
Registered Company Number: 3484466
OCR is an exempt Charity

OCR (Oxford Cambridge and RSA Examinations)
Head office
Telephone: 01223 552552
Facsimile: 01223 552553

© OCR 2017

