

Mark Scheme (Results)

June 2014

Pearson Edexcel GCSE
Design & Technology (5EP02/01)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1	B	(1)
Question Number	Answer	Mark
2	D	(1)
Question Number	Answer	Mark
3	D	(1)
Question Number	Answer	Mark
4	A	(1)
Question Number	Answer	Mark
5	D	(1)
Question Number	Answer	Mark
6	A	(1)
Question Number	Answer	Mark
7	B	(1)
Question Number	Answer	Mark
8	D	(1)
Question Number	Answer	Mark
9	A	(1)
Question Number	Answer	Mark
10	C	(1)

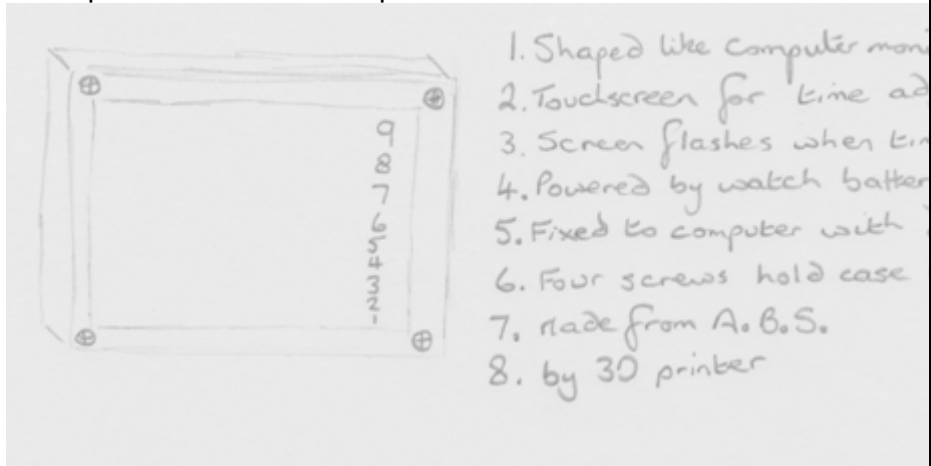
Question Number	Answer	Mark										
11 (a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="424 300 663 645" style="width: 30%; text-align: center; vertical-align: middle;">Variable resistor</td> <td data-bbox="663 300 1158 645">To control/ restrict current by varying amounts/volume control/speed control/in dimmer switches/to adjust sensitivity/set voltage levels/create potential divider (1)</td> </tr> <tr> <td data-bbox="424 645 663 824" style="text-align: center; vertical-align: middle;">Piezo-electric sensor</td> <td data-bbox="663 645 1158 824">To make sound/to detect pressure/vibrate/impact/to sense strain (1) (Not movement)</td> </tr> <tr> <td data-bbox="424 824 663 1037" style="text-align: center; vertical-align: middle;">Light dependant resister (LDR) (1)</td> <td data-bbox="663 824 1158 1037" style="text-align: center; vertical-align: middle;">For sensing light levels (Not a light sensor)</td> </tr> <tr> <td data-bbox="424 1037 663 1115" style="text-align: center; vertical-align: middle;">Ammeter (1)</td> <td data-bbox="663 1037 1158 1115" style="text-align: center; vertical-align: middle;">To measure current</td> </tr> <tr> <td colspan="2" data-bbox="424 1115 1158 1155" style="text-align: right;">4 x 1</td> </tr> </table>	Variable resistor	To control/ restrict current by varying amounts/volume control/speed control/in dimmer switches/to adjust sensitivity/set voltage levels/create potential divider (1)	Piezo-electric sensor	To make sound/to detect pressure/vibrate/impact/to sense strain (1) (Not movement)	Light dependant resister (LDR) (1)	For sensing light levels (Not a light sensor)	Ammeter (1)	To measure current	4 x 1		4
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4 x 1												
11(b)	<p>A - Named switch; Toggle/Key/Slide/SPST/Rocker/latching [but not; push to make, push to break, rotary, tilt] B – Thyristor</p> <p style="text-align: right;">2 x 1</p>	2										
11(c)	<p>Push to make/PTM (1)</p> <p style="text-align: right;">1 x 1</p>	1										
11(d)	<p>Turns on/sound/buzz/make a noise/ (1) Stays on/latches/continues to sound/buzz/make a noise (1)</p> <p style="text-align: right;">2 x 1</p>	2										
11(e)	<ul style="list-style-type: none"> • It shorts out/bypasses the thyristor (1) and resets the circuit/thyristor (1) • It takes the voltage at the anode low/interrupts the flow of current to the anode (1) It turns off the buzzer (1) <p><i>[Accept mix & match as appropriate]</i></p> <p style="text-align: right;">2 x 1</p>	2										

11(f)	<p>Any two from:</p> <ul style="list-style-type: none"> • Using fewer components (1) reduces costs (1) • Needs no driver/amplifier circuit (1) reducing size (1) • Smaller circuit (1) enables more compact product (1) • Less assembly required (1) enabling more rapid manufacture (1) • Can be PCB mounted (1) making circuit more robust (1) <p>(Do not accept smaller or cheaper)</p> <p style="text-align: right;">2 x 2</p>	<p style="text-align: center;">4</p>
11(g)	<p>Name: Solar/rechargeable battery/geothermal/wind/biomass/mains (1)</p> <p>Reason: No pollution/no landfill/no CO2/no fossil fuels needed/don't need materials for new batteries/don't need to drive to get new batteries/no harmful waste from old batteries/ only needs light (1) <i>[power supply and reason must be linked]</i></p> <p style="text-align: right;">1 x 2</p>	<p style="text-align: center;">2</p>
11(h)	<p>One explanation from:</p> <ul style="list-style-type: none"> • Complex shapes can be easily produced (1) accurately (1) • Integral fixing components or holes (1) can be included in the moulding (1) • Highly automated process (1) reduces costs (1) • Fast process (1) suitable for high volume production (1) • Wall thickness can be varied easily (1) to optimise strength and weight (1) • High quality finish (1) so no finishing required (1) <p style="text-align: right;">2 x 1</p>	<p style="text-align: center;">2</p>

Question Number	Answer	Mark
12.	<p>Candidates may answer any specification point in either graphical form or by annotation.</p> <p>No marks are awarded for the quality of graphical communication.</p> <ul style="list-style-type: none"> • have a computer theme (1) : e.g. keyboard, monitor, mouse • be adjustable for different time periods (1) : e.g. rotary switch, slide switch, must be electronic • have a method of warning when time is up (1) : e.g. buzzer, flashing lights, audio/visual alarm • have a suitable power supply (1) : e.g. named battery, mains, nine v battery, USB to PC • be attachable to and removable from the computer (1) : e.g. clip, clamp, screws, Velcro, suction pad • have a method of accessing the circuit for maintenance (1) : e.g. screws, sliding panel, hinges • be made of a material suitable for a prototype (1) : e.g. acrylic, pine, brass • be made using process(es) suitable for prototype manufacture (1) : e.g. strip heating, PVA glue, soldering, not injection moulding <p><i>[Process must be appropriate to material]</i></p>	

Design idea 1

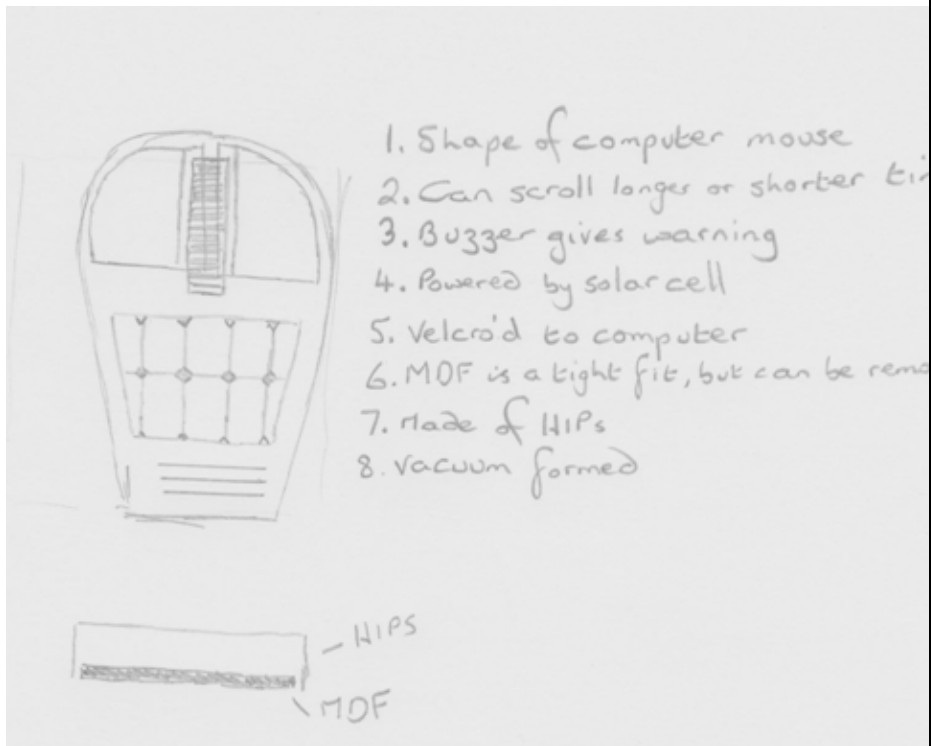
Example of candidate responses:



Design idea 2

Marks for design idea 2 can only be awarded where specification points are resolved differently than in design idea 1.

Example of candidate response:



Question Number	Answer	Mark
13(a)	<p>Any one from:</p> <ul style="list-style-type: none"> • It is rounded (1) so doesn't dig into the hand (1) • It's a suitable size/small (1) so is easy to hold (1) • The buttons are suitably positioned (1) so are easy to reach with fingers/thumb (1) <p style="text-align: right;">1 x 2</p>	2
Question Number	Answer	Mark
13(b)	<p>Any two from:</p> <ul style="list-style-type: none"> • Low power/current requirement (1) to extend battery life (1) • More energy efficient(1) so more environmentally friendly (1) • High resolution (1) so easy to read (1) • Thinner display (1) enables more compact product (1) • Colour display (1) is attractive/appealing (1) • Range of colours (1) can convey more information (1) <p>Mix & match if appropriate</p> <p style="text-align: right;">2 x 2</p>	4
Question Number	Answer	Mark
13(c)	<p>Any two from:</p> <ul style="list-style-type: none"> • Greater accuracy (1) means higher quality products (1) • Ease of repeatability (1) speeds up design modifications (1) • Ease of modification (1) enables changes to manufacture (1) • Electronic communication (1) allows workers across the world to work together (1) • Can manufacture directly (1) from CAD drawings (1) • Virtual testing (1) avoids destructive testing (1) • Constant quality (1) fewer rejects (1) • Less human error (1) So fewer mistakes (1) • Virtual 3D images (1) Enable better visualisaion (1) <p>Mix and match if appropriate</p> <p style="text-align: right;">2 x 2</p>	4

Question Number	Answer	Mark																		
13. (d) QWC	<p>Evaluation to address the following issues. Marks should be gained for reasoned & justified statements, not a simple check-list.</p> <table border="1" data-bbox="389 342 1193 1243"> <thead> <tr> <th data-bbox="389 342 788 383">HIPS</th> <th data-bbox="788 342 1193 383">Aluminium</th> </tr> </thead> <tbody> <tr> <td data-bbox="389 383 788 490">Not as tough as aluminium, and may crack if dropped</td> <td data-bbox="788 383 1193 490">More robust/durable than HIPS so less likely to crack</td> </tr> <tr> <td data-bbox="389 490 788 703">The handset will be lightweight and easier to hold</td> <td data-bbox="788 490 1193 703">Aluminium is heavier than HIPS, so product is heavier to hold/feels like a better quality product.</td> </tr> <tr> <td data-bbox="389 703 788 810">Insulator so short-circuits are not possible.</td> <td data-bbox="788 703 1193 810">Conductor, so short-circuits are possible.</td> </tr> <tr> <td data-bbox="389 810 788 918">Requires oil reserves for its production which are limited</td> <td data-bbox="788 810 1193 918">Requires aluminium ore/bauxite for its production</td> </tr> <tr> <td data-bbox="389 918 788 990">Can be recycled</td> <td data-bbox="788 918 1193 990">Can be recycled</td> </tr> <tr> <td data-bbox="389 990 788 1061">Easily formed</td> <td data-bbox="788 990 1193 1061">Harder to form</td> </tr> <tr> <td data-bbox="389 1061 788 1133">Low cost</td> <td data-bbox="788 1061 1193 1133">More expensive</td> </tr> <tr> <td data-bbox="389 1133 788 1243">Available in many colours</td> <td data-bbox="788 1133 1193 1243">Required painting/anodising for colour</td> </tr> </tbody> </table>	HIPS	Aluminium	Not as tough as aluminium, and may crack if dropped	More robust/durable than HIPS so less likely to crack	The handset will be lightweight and easier to hold	Aluminium is heavier than HIPS, so product is heavier to hold/feels like a better quality product.	Insulator so short-circuits are not possible.	Conductor, so short-circuits are possible.	Requires oil reserves for its production which are limited	Requires aluminium ore/bauxite for its production	Can be recycled	Can be recycled	Easily formed	Harder to form	Low cost	More expensive	Available in many colours	Required painting/anodising for colour	(6)
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Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-2	Candidate identifies the area(s) of comparison with no development OR identifies and develops one area. Shows limited understanding of the comparison. Writing communicates ideas using everyday language but the response lacks clarity and organisation. The candidate spells, punctuates and uses the rules of grammar with limited accuracy.
Level 2	3-4	Candidate identifies some areas of comparison with associated developments showing some understanding of the comparison. Writing communicates ideas using D&T terms accurately and showing some direction and control in the organising of material. The candidate uses some of the rules of grammar appropriately and spells and punctuates with some accuracy, although some spelling errors may still be found.
Level 3	5-6	Candidate identifies a range of areas of comparison with associated developments showing a detailed understanding of the comparison. Writing communicates ideas effectively, using a range of appropriately selected D&T terms and organising information clearly and coherently. The candidate spells, punctuates and uses the rules of grammar with considerable accuracy.

Question Number	Answer	Mark
14(a)	Resistor/fixed resistor (1)	1
14(b)	<ul style="list-style-type: none"> To change its resistance (1) by sensing a change in temperature (1) It will change the current (1) when its gets hotter/colder (1) <p style="text-align: right;">2 x 1</p>	2
14(c)	<ul style="list-style-type: none"> The voltage from the inverting/variable input (1) Is compared to the non-inverting/fixed input (1) And the difference is amplified (1) <p style="text-align: right;">3 x 1</p>	3
14(d)	<p>The thermistor and fixed resistor/potential divider (1) are swapped over (1)</p> <p>To put an inverter (1) at the output of the op-amp (1)</p> <p>To swap (1) the inputs to the op-amp (1)</p> <p style="text-align: right;">2 x 1</p>	2
14(e)	<ul style="list-style-type: none"> The output/current of the op-amp is amplified/increased/made bigger (1) to give enough power to the lamp (1) It acts as a switch (1) to turn on the bulb (1) A small current at the base (1) enables a large current to flow from the collector to the emitter (1) <p style="text-align: right;">1 x 2</p>	2
14(f)	<p>Answer of 36 (3) OR</p> <p>Rearranging formula to $R=V/I$ (1)</p> <p>Identifying V as 9 AND I as 0.25 (1)</p> <p>Final answer of 36 (1)</p> <p><i>[ecf maximum 2 marks]</i></p> <p style="text-align: right;">3 x 1</p>	3

Question Number	Answer	Mark				
14(g) QWC	<p>Discussion to address the following issues:</p> <p>virtual modelling</p> <table border="1"> <thead> <tr> <th>Advantages</th> <th>Disadvantages</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> • Details can be modified easily which means drawings can be completed quickly • Work can be sent electronically which means it can be sent anywhere in the world • Information can be uploaded to CAM machines so there is no delay from drawing to moulding • Virtual models need no materials saving time/ costs/ materials • Saving uses no space </td> <td> <ul style="list-style-type: none"> • Workers may require retraining which is costly • Hardware and software are expensive, reducing profits • Programs can crash/ so data can be lost • Power can be lost so hardware could be damaged • Software is updated so new software needs to be purchased • All users must have compatible software or data will not be read </td> </tr> </tbody> </table>	Advantages	Disadvantages	<ul style="list-style-type: none"> • Details can be modified easily which means drawings can be completed quickly • Work can be sent electronically which means it can be sent anywhere in the world • Information can be uploaded to CAM machines so there is no delay from drawing to moulding • Virtual models need no materials saving time/ costs/ materials • Saving uses no space 	<ul style="list-style-type: none"> • Workers may require retraining which is costly • Hardware and software are expensive, reducing profits • Programs can crash/ so data can be lost • Power can be lost so hardware could be damaged • Software is updated so new software needs to be purchased • All users must have compatible software or data will not be read 	
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