

Mark Scheme (Results)

Summer 2010

GCSE

GCSE Design and Technology:
Electronic Product (5EP02)
Paper 01.
Knowledge and Understanding of
Electronic Products.

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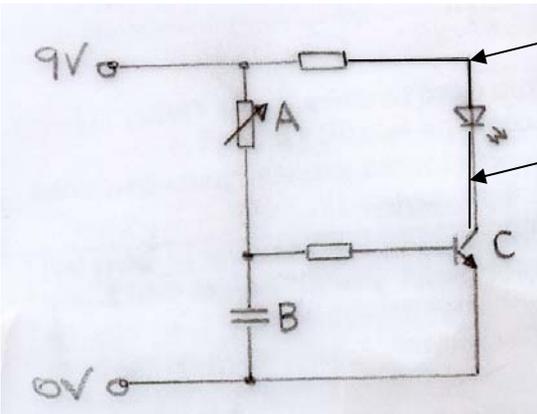
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General Marking Guidance

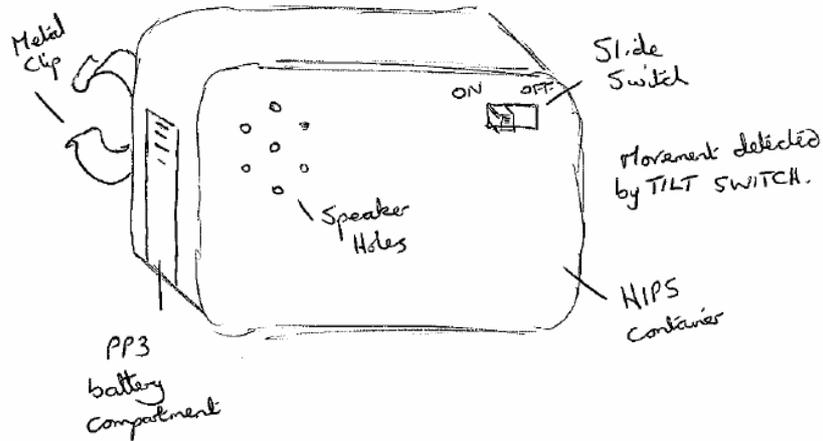
- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should 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	C No alternatives (1 mark)	1
2	B No alternatives (1 mark)	1
3	A No alternatives (1 mark)	1
4	C No alternatives (1 mark)	1
5	D No alternatives (1 mark)	1
6	A No alternatives (1 mark)	1
7	C No alternatives (1 mark)	1
8	B No alternatives (1 mark)	1
9	B No alternatives (1 mark)	1
10	A No alternatives (1 mark)	1

Question Number	Answer	Mark	
11a	Reed Switch	detecting movement/position (1)	
	Seven segment display, (also accept eight segment display, 7 seg display) (1)	To display numbers	
	Side cutters	for trimming component leads, for cutting wire (1)	
	Multimeter, multi-purpose test meter (1)	For testing voltage, resistance, current.	
		(4 x 1)	4
b (i)	A - Variable resistor/potentiometer/pot B - Capacitor/polarised capacitor/electrolytic capacitor C - Transistor/NPN transistor	(3 x 1)	3
b (ii)	Any combination of the following: <ul style="list-style-type: none"> Amplifies current (1) which allows the output to function (1) It switches on the LED (1) at a certain voltage (1) It amplifies current (1) to turn on the light/LED (1) 	(2 x 1)	Max 2
c	Orange Brown Award 1 mark for orange first, award one mark for brown second.	(2 x 1)	2
d	Award one mark for each correct point indicated.		
		(2 x 1)	2
e(i)	Place plastic sheet in the former Heat the plastic sheet Switch on the suction pump Allow to cool Award one mark for each line in the correct sequence, up to a maximum of four.	(4 x 1)	4
e(ii)	Any two of the following: <ul style="list-style-type: none"> Be careful of burns (1) don't put anything on top of the heater (1) 		

	<ul style="list-style-type: none"> • keep flammable materials away from the machine (1) • don't leave the machine unattended (1) • make sure the mains cable isn't damaged (1) • wear heatproof gloves (1) <p style="text-align: right;">(2 x 1)</p>	2
Question Number	Answer	Mark
12	<p>Design Idea 1</p> <p>Candidates may answer any specification point in either graphical form or by annotation.</p> <p>Specification point 1: Have a simple casing</p> <ul style="list-style-type: none"> • Drawings and annotation will refer to the simplicity of the casing, or its ease of manufacture. <p>Specification point 2: Be attached to a bicycle</p> <ul style="list-style-type: none"> • The drawing or annotation must make clear reference to how the device connects to some part of a bicycle. <p>Specification point 3: Be switched on and off</p> <ul style="list-style-type: none"> • Have some form of switch. <p>Specification point 4: Be battery powered</p> <ul style="list-style-type: none"> • Some reference to a type or size of battery. <p>Specification point 5: Allow the battery to be replaced</p> <ul style="list-style-type: none"> • An opening, sliding lid is drawn, labelled or referred to. <p>Specification point 6: Detect movement of the bicycle</p> <ul style="list-style-type: none"> • Some reference to type of movement detection. <p>Specification point 7: Have an audible output</p> <ul style="list-style-type: none"> • Clear reference to specific type of output device. <p>Specification point 8: Be made from materials available in a school workshop</p> <ul style="list-style-type: none"> • Clear reference to specific material. 	

Example of candidate response:



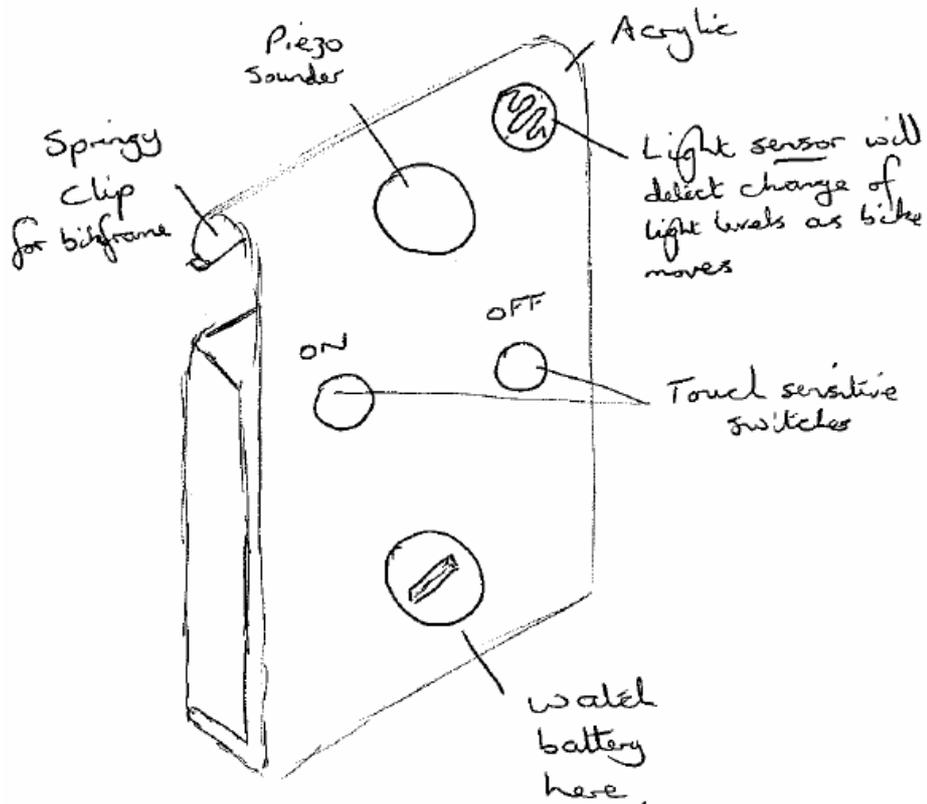
8

(8 X 1)

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:



(8 X 1)

8

Question Number	Answer	Mark												
13a (i)	Any one of: <ul style="list-style-type: none"> • Large (1) so easy to see (1) • Illuminated (1) so can be seen in the dark (1) • LCD display (1) so different colours can be used (1) <p style="text-align: right;">(2 X 1)</p>	2												
13a (ii)	Any one of: <ul style="list-style-type: none"> • Jack socket (1) fits most earphone sockets (1) • Socket is at bottom of MP3 (1) so can be easily reached (1) <p style="text-align: right;">(2 X 1)</p>	2												
13b	Any two from: <ul style="list-style-type: none"> • Tough (1) so will not break (1) • Rigid (1) so will protect circuit (1) • Waterproof (1) so will not deteriorate (1) • Recyclable (1) to reduce environmental impact (1) • Easily moulded (1) to minimise production costs (1) <p style="text-align: right;">(2 X 2)</p>	4												
13c	Any one from: <ul style="list-style-type: none"> • Short product life (1) so product does not have to be durable(1) • Product will be thrown away (1) so there will be repeat sales (1) <p style="text-align: right;">(2 X 1)</p>	2												
13d	Evaluation to address the following issues: <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">Injection Moulding</td> <td style="width: 50%; padding: 5px;">Vacuum Forming</td> </tr> <tr> <td style="padding: 5px;">Fast & accurate process that is suited only to high volume production</td> <td style="padding: 5px;">Slower process; used in batch production.</td> </tr> <tr> <td style="padding: 5px;">High set-up costs of machinery and tooling: high quality steel moulds last for many thousand mouldings.</td> <td style="padding: 5px;">Cheap to set-up; moulds made from materials with limited lifespan.</td> </tr> <tr> <td style="padding: 5px;">Once set-up costs are recouped, mouldings are cheap to produce.</td> <td style="padding: 5px;">Mouldings are relatively cheap to produce: production costs do not change.</td> </tr> <tr> <td style="padding: 5px;">Complex shapes can be moulded in one piece.</td> <td style="padding: 5px;">Moulds must have draft/release angles and can only produce shapes with no undercuts and constant thickness.</td> </tr> <tr> <td style="padding: 5px;">Mouldings require no finishing and rejects can be remoulded.</td> <td style="padding: 5px;">Mouldings require trimming from a sheet of material; rejects are wasted and cannot be reformed.</td> </tr> </table> <p style="text-align: right; margin-top: 10px;">(Max 6 marks)</p>	Injection Moulding	Vacuum Forming	Fast & accurate process that is suited only to high volume production	Slower process; used in batch production.	High set-up costs of machinery and tooling: high quality steel moulds last for many thousand mouldings.	Cheap to set-up; moulds made from materials with limited lifespan.	Once set-up costs are recouped, mouldings are cheap to produce.	Mouldings are relatively cheap to produce: production costs do not change.	Complex shapes can be moulded in one piece.	Moulds must have draft/release angles and can only produce shapes with no undercuts and constant thickness.	Mouldings require no finishing and rejects can be remoulded.	Mouldings require trimming from a sheet of material; rejects are wasted and cannot be reformed.	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 student spells, punctuates and uses the rules of grammar with limited accuracy.
Level 2	3 - 4	Candidate identifies some areas of comparison with associated development 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 student 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 student spells, punctuates and uses the rules of grammar with considerable accuracy.

Question Number	Answer	Mark
14a(i)	It adjusts the temperature at which the circuit switches. Alters sensitivity of circuit. (1 x 1)	1
14a(ii)	It protects the transistor (1) against back EMF (1) (2 X 1)	2
14a(iii)	$4.5 \times 10^{-4} \text{A}$ or 0.45mA 1 mark for the correct number, 1 mark for the correct units A or mA (2 X 1)	2
14a(iv)	<ul style="list-style-type: none"> The Op-Amp compares two voltages (1) So the resistors provide the required reference voltage (1) (2 X 1)	2
14b(i)	Any one from: <ul style="list-style-type: none"> ready made (1) so no processing required (1) very economical (1) so saves money (1) no conductors (1) so designer can choose their own circuit layout (1) save/reuse components (1) to minimise costs (1) can change components (1) to get correct value (1) (2 X 1)	2
14b(ii)	Any one from: <ul style="list-style-type: none"> ready made (1) so no processing required (1) conductors already in place (1) saving time (1) holes already drilled (1) so a drill is not required (1) Award no marks if the candidate has repeated a point made above. (2 X 1)	2
14b(iii)	Any one from: <ul style="list-style-type: none"> custom made (1) so can be very small (1) 	

	<ul style="list-style-type: none"> conductors already in place (1) saving time (1) economical (1) when produced in volume (1) can use pick & place machinery (1) for volume production (1) can use automated soldering (1) and save labour costs (1) <p>Award no marks if the candidate has repeated a point made above. (2 X 1)</p>	2												
14c	<p>Evaluation to address the following issues:</p> <table border="1"> <tr> <td>Advantages</td> <td>Disadvantages</td> </tr> <tr> <td>No running costs</td> <td>Not much energy available</td> </tr> <tr> <td>No pollution/greenhouse gasses</td> <td>High set-up costs</td> </tr> <tr> <td>Don't need to connect to the National grid</td> <td>Dependant on weather/cloud cover</td> </tr> <tr> <td>No power cuts</td> <td>No power at night-time</td> </tr> <tr> <td>Don't use limited fossil fuel</td> <td></td> </tr> </table> <p>(more responses may come forward at pre-standardisation) (Max 6 marks)</p>	Advantages	Disadvantages	No running costs	Not much energy available	No pollution/greenhouse gasses	High set-up costs	Don't need to connect to the National grid	Dependant on weather/cloud cover	No power cuts	No power at night-time	Don't use limited fossil fuel		6
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Level 1	1 - 2	Candidate identifies the issues with no development OR identifies and develops one area. Shows limited understanding of the issues. 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 issues with associated developments showing some understanding of the issues. 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.
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