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# Mark Scheme (Results)

June 2011

## GCSE Design & Technology: Electronic Products
## (5EP02/01: Knowledge and Understanding of Electronic Products)

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| Question Number | Answer | Mark |
|---|---|---|
| **1** | B – thermistor (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **2** | C – thyristor (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **3** | C - ventilation (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **4** | D – mild steel (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **5** | A – NOT (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **6** | A – Ammeter (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **7** | D – LCD (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **8** | B - Vacuum forming (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **9** | C – Diode (no alternatives) | **(1)** |
| Question Number | Answer | Mark |
| **10** | C – DPDT (no alternatives) | **(1)** |

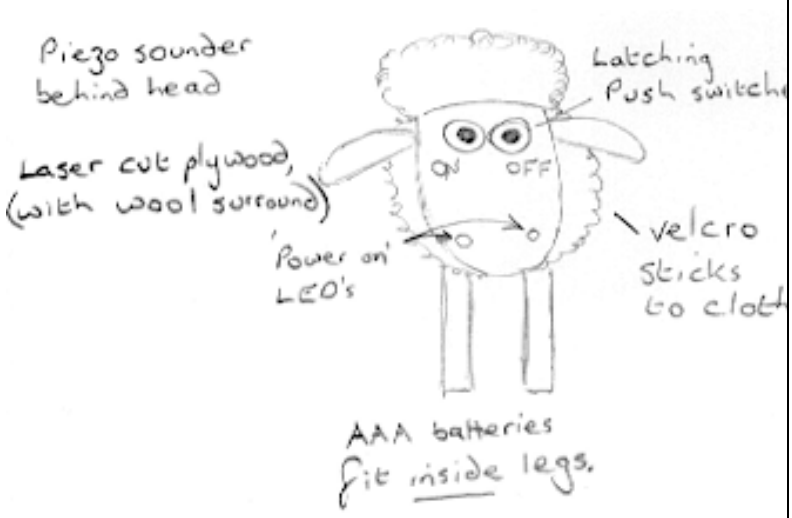
<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>11 (a)</td><td>
<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>Solar cells</td><td>Converting sunlight into electricity / generating electricity / powering things (1)</td><td></td></tr>
<tr><td>Relay</td><td>Linking two circuits / allowing a low power circuit to switch a high current / voltage / power for safety (1)</td><td></td></tr>
<tr><td>Speaker / loudspeaker (1)</td><td>To convert electrical energy to sound</td><td></td></tr>
<tr><td>Soldering iron stand / holder / Soldering stand / dock (1)</td><td>To hold a soldering iron safely</td><td></td></tr>
</table>
(4)</td></tr>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>11(b)</td><td>A – Light dependent resistor/LDR/Light sensor (1)<br>B – Light Emitting Diode/LED (1)<br>C – Transistor (1)</td><td>(3)</td></tr>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>11(c)</td><td>Any two from:<br>It will adjust the sensitivity (1) of the circuit (1)<br>It will make the transistor/light turn on/off (1) at different light levels (1)</td><td>(2)</td></tr>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>11(d)</td><td>• Identifying I as 0.002 [ecf](1)<br>• Answer of 3K5/3.5K/3500 (1)<br>• Units in Ohms / Ω /KΩ/K (1)</td><td>(3)</td></tr>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>11(e)</td><td>Battery<br>• Energy is always available/requires less space/can be used 24.7/portable/readily available/low initial cost (1)<br>• Expensive in the long term/environmentally damaging/have to be disposed of/have to be replaced (1)<br>• Do NOT accept unqualified ‘cheap’ or ‘expensive’.</td><td>(2)</td></tr>
</table>

| | | |
|---|---|---|
| | **Solar Power**<br>• no on-going costs/free energy/environmentally friendly/green/renewable/long lifespan (1)<br>• No power generated at night or dull days / high initial costs / take up lots of space (1) | **(2)** |
| Question Number | Answer | Mark |
| **11(f) (i)** | Any **one** from:<br>• carbon dioxide ($CO_2$) (1)<br>• methane (1)<br>• nitrous oxide (1)<br>• sulphur hexafluoride (1) | **(1)** |
| **(ii)** | **Two** stated from:<br>• Reducing energy consumption (1)<br>• Introducing legislation (1)<br>• Filtering/scrubbing (1)<br>• Increasing efficiency (1) e.g. use car less, insulate buildings,<br>• Use renewable energy sources (1)<br>• Use nuclear energy (1)<br>• Do NOT accept 'use electric/hydrogen cars' or 'use rechargeable batteries'. | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **12** | **Design idea 1**<br><br>Candidates may answer any specification point in either graphical form or by annotation. Accept responses relating to receivers as well as transmitters.<br><br>**No marks are awarded for the quality of graphical communication.**<br><br>• **Look attractive to young children (1):**<br>Any creative idea that will appeal to children/use of colour/interesting or recognizable shapes.<br>• **Attach to the children or their clothing (1):**<br>A clear means of tying/fixing/clipping to clothing or the child.<br>• **Have a means of being switched on and off (1):**<br>A clearly labeled specific type of switch.<br>• **Have a 'power on' indicator (1):**<br>A LED, tri-colour LED lamp/bulb or similar named indicator.<br>• **Emit a loud noise when activated (1):**<br>Reference to a buzzer, bell, piezo sounder, loudspeaker or similar.<br>• **Have its own power supply (1):**<br>Reference to a specific battery, wind-up mechanism or solar panel, etc. Different size/types of batteries are considered different.<br>• **Be made of an appropriate material (1):**<br>Any material suitable for use in a school workshop, e.g. HIPS, MDF, plywood, aluminum sheet, etc.<br>• **Be made by an appropriate manufacturing method (1):**<br>This method must be appropriate for use in a school workshop and for the suggested material, e.g. vacuum forming, bending, gluing, sanding, etc. (accept injection moulding). | |

**Design idea 1**

**8X1**

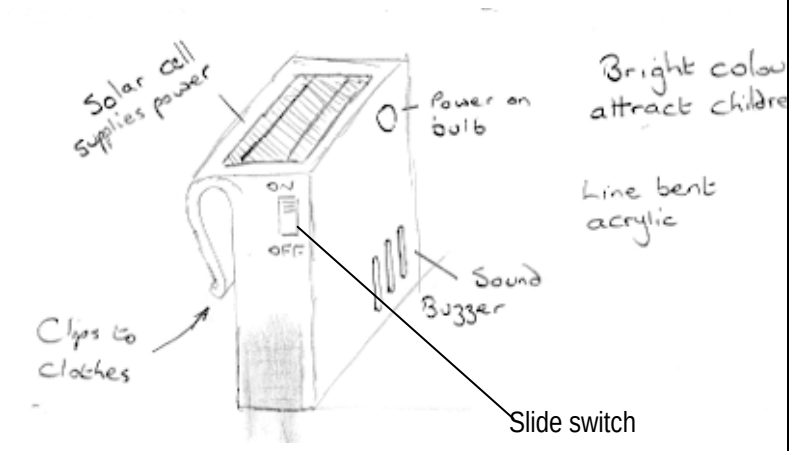



**Design idea 2**

Marks for design idea 2 can only be awarded where specification points are resolved differently than in design idea 1. **(8)**

Example of candidate response:

**8X1**




**(8)**

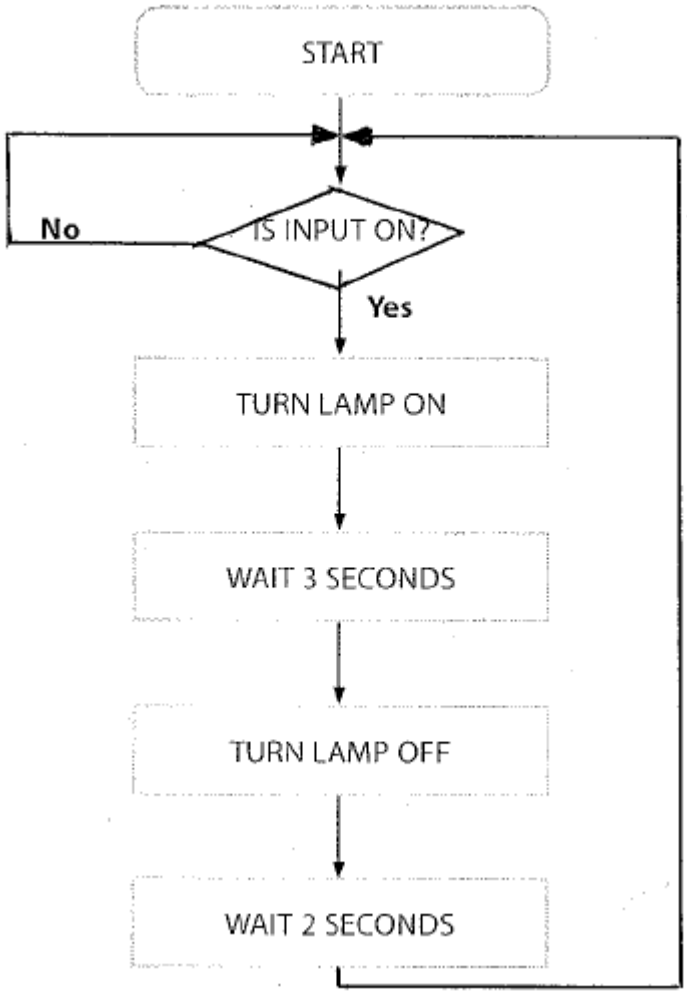
| Question Number | Answer | Mark |
|---|---|---|
| **13(a)** | **Two** given from:<br>• visible in the dark (1)<br>• low energy requirement (1)<br>• remain cool (1)<br>• long life (1)<br>• available in many colours (1)<br>• economical to buy/run (1)<br>• compact (1)<br>• easy to read (1)<br>• doesn't bounce around (1) | **(2)** |
| Question Number | Answer | Mark |
| **13(b)** | **Two** features with justifications from:<br>• Transparent (1) so LEDs can be seen (1)<br>• Durable (1) so it lasts a long time (1)<br>• Easily manufactured (1) keeping costs low (1)<br>• Hard (1)<br>• Accept justification for waterproof (1), but not waterproof itself. | **(4)** |
| Question Number | Answer | Mark |
| **13(c)(i)** | **One** explanation from:<br>• The driver can easily see (1) the number of glowing LEDs (1)<br>• The LEDs light up (1) so the driver can easily read the instrument (1)<br>• Graphical display(1) so quick/easy to read(1) | **(2)** |
| Question Number | Answer | Mark |
| **13(c)(ii)** | **One** explanation from:<br>• Round shape (1) enables easy insertion into hole (1)<br>• The threaded rods (1) can be held with nuts (1)<br>• Electrical connections (1) easy to clip onto (1) | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **13 (d)** | **Evaluation to address the following issues:** | |

| Solar cells | Wind Turbines |
|---|---|
| silent | noisy |
| Produce energy during most of the day/ no output at night | can disturb TV reception |
| require no additional land | occupy land |
| usually sited on buildings | often on hills/offshore |
| expensive per unit of electricity produced | lower cost per unit of electricity generated |
| low maintenance | higher maintenance |
| poor output in winter | visually intrusive |
| | may harm wildlife/birds |
| low energy density power source | high energy density power source |
| renewable electricity source | renewable electricity source |
| no emissions | no emissions |
| can be small or large | need wind to operate |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No rewardable material |
| Level | 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 | 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 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 | 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 accurately and organising information clearly and coherently. The student spells, punctuates and uses the rules of grammar with considerable accuracy. | |

| Question Number | Answer | Mark |
|---|---|---|
| **14(a)** | • diamond/kite (1)<br>• Flash Feedback (1)<br>• Input feedback (1)<br>  | **(3)** |
| Question Number | Answer | Mark |
| **14(b)(i)** | Any **two** from:<br>• PICs require fewer external components (1)<br>• PICs are more easily adjusted / for complex sequences (1)<br>• PICs can be reprogrammed for different output (1)<br>• 555 chips can only generate simple astable or monostable waveforms (1)<br>• PICs may have more outputs(1) | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **14(b) (ii)** | Any **two** explanations:<br>• Faster (1) because no staff training required (1)<br>• Lower cost (1) because lower labour costs (1)<br>• Can work continuously (1) giving higher productivity (1)<br>• No human input(1) so lower error rates (1)<br>• Real components will not be damaged (1) saving money (1)<br>• The computer will tell you where the mistake is (1) so it can easily be fixed (1) | **(2)** |
| Question Number | Answer | Mark |
| **14(c) QWC** | Discussion to address the following issues:<br>• Reduced costs(1) will increase manufacturer's profits(1)<br>• Increased landfill(1) from discarded products(1)<br>• More raw materials needed(1) for replacement products(1)<br>• More pollution(1) caused by transporting more products to shops/landfill(1)<br>• Consumers will be able to have up-to-date products(1)<br>• Customer dissatisfaction when product fails (1)<br>• Manufacturer may lose customer loyalty(1) | **(6)** |

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No rewardable material |
| Level 1 | 1-2 | Candidate identifies the effect(s) with no development OR identifies and develops one effect. Shows limited understanding of the effects. The student uses basic language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar used with limited accuracy. |
| Level 2 | 3-4 | Candidate identifies some effects with associated developments showing some understanding of the effects. The student uses some design and technology terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar used with some accuracy. Some spelling errors may still be found. |
| Level 3 | 5-6 | Candidate identifies a range of effects with associated developments showing a detailed understanding of the effects. The student uses a range of appropriate design and technology terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy. |

| Question Number | Answer | Mark |
|---|---|---|
| **14(d)(i)** | Any **two** from:<br>• The anode is the longer leg/the cathode is the shorter leg (1)<br>• The '-' signs on the can point to the negative leg (1)<br>• The indent (on an axial capacitor) is nearest the anode (1) | **(2)** |
| Question Number | | |
| **14(d)(ii)** | Correct answer = 6K / 6000 (1) | **(1)** |
| **14(d)(iii)** | R1 controls the flow of current (1) into C1 which stores the charge (1) and switches the Transistor after a time delay (1)<br><br>C1 charges (1) through R1 (1) and switches the transistor on when it reaches threshold voltage (1)<br><br>R1 and C1 act as a potential divider (1) when the potential/voltage is high enough (1) the transistor is triggered/switched on (1) | **(3)** |

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