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# Mark Scheme (Results)

## Summer 2012

## GCSE Design and Technology
## Electronic Products (5EP02)

## Paper 01 Knowledge and Understanding of Electronic Products

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Summer 2012
Publications Code UG031972

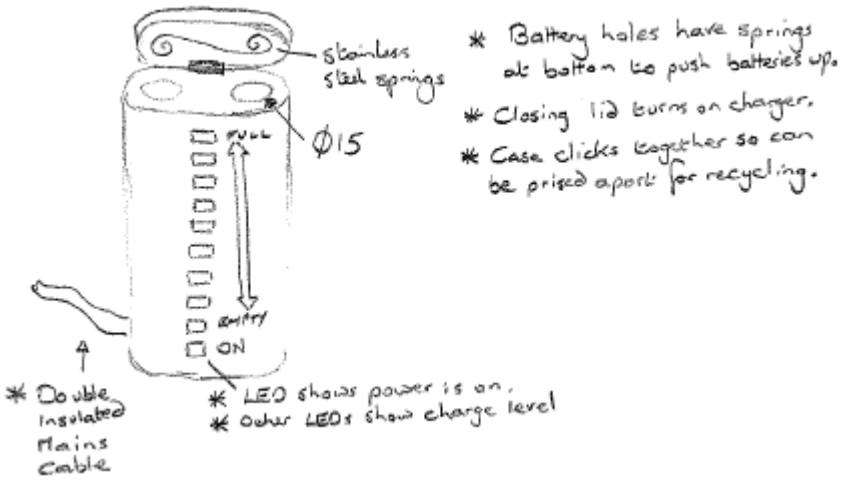
| Question Number | Answer | Mark |
|---|---|---|
| 1 | A | (1) |
| Question Number | Answer | Mark |
| 2 | B | (1) |
| Question Number | Answer | Mark |
| 3 | C | (1) |
| Question Number | Answer | Mark |
| 4 | B | (1) |
| Question Number | Answer | Mark |
| 5 | C | (1) |
| Question Number | Answer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

<table>
<tr><td>Question Number</td><td colspan="2">Answer</td><td>Mark</td></tr>
<tr><td rowspan="5">11. (a)</td><td>Name</td><td>Use</td><td rowspan="5">(4 X 1)</td></tr>
<tr><td>SLIDE-switch / double pole double throw switch / DPDT switch / SPDT switch (1).</td><td>Turning a circuit on/off</td></tr>
<tr><td>7 segment display / 7 seg display (1)</td><td>Displaying digits from 0-9</td></tr>
<tr><td>Resistor</td><td>Resisting / reducing / limiting current / electricity / voltage / power (1)<br><br>Note: Not protects or slows</td></tr>
<tr><td>Stripboard</td><td>Making / prototyping circuits / fixing / attaching components / soldering components (1)</td></tr>
<tr><td>Question Number</td><td colspan="2">Answer</td><td>Mark</td></tr>
<tr><td>11.(b)</td><td colspan="2">A – Piezo/ Piezo electric sensor/sounder (1)<br>B – Thyristor (1)</td><td>(2 X 1)</td></tr>
<tr><td>Question Number</td><td colspan="2">Answer</td><td>Mark</td></tr>
<tr><td>11.(c)</td><td colspan="2">One cross on the top rail or top leg of buzzer or to left of switch (1)<br>One cross between the buzzer & the thyristor (1)</td><td>(2)</td></tr>
<tr><td>Question Number</td><td colspan="2">Answer</td><td>Mark</td></tr>
<tr><td>11.(d)</td><td colspan="2">One explanation from:<br>It latches (1) so that it stays on once triggered (1)<br>It remembers (1) once its switched on (1)<br>It switches on the buzzer/output (1) and keeps it on (1)</td><td>(2)</td></tr>
<tr><td>Question Number</td><td colspan="2">Answer</td><td>Mark</td></tr>
<tr><td>11. (e)</td><td colspan="2">Excessive / high voltage / current / heat / power/ a spike (1)</td><td>(1)</td></tr>
</table>

| Question Number | Answer | Mark |
|---|---|---|
| **11.(f)** | Any **two** from:<br>• Thinner/narrower PCB tracks (1)<br>• Make circuit more compact (1)<br>• Recycle old PCBs (1)<br>• Reclaim copper from ferric chloride ('acid') solution (1)<br>• Only use copper from 'ethical/recycled' sources (1)<br>• Make the product have a longer life(1)<br><br>*Note: Do not accept 'use less copper'.* | (2 x 1) |
| Question Number | Answer | Mark |
| **11.(g)i** | **One** explanation from:<br>• Where a company manufacturers products in different countries (1) to reduce costs (1)<br>• Where a company manufactures products in a different country (1) in order to import back to their own country (1) | (2 X 1) |
| Question Number | Answer | Mark |
| **11.(g)ii** | Advantages – anyo**ne** from;<br>• Lower overhead costs (1)<br>• Cheaper workforce / manufacturing (1)<br>• Can be near source of raw materials (1)<br>• Can be nearer markets (1)<br>• Don't have to follow UK / European laws(1)<br>*Note: Do not accept 'cheaper' on its own* | (1) |
| | Disadvantages – anyo**ne** from;<br>• Language barriers (1)<br>• Different laws (1)<br>• Transportation may be slow (1)<br>• Transportation may be expensive (1)<br>• Are harder to monitor (1) | (1) |
| | | |
| **11. (h)** | Any **two** from:<br>• Thermosoftening plastic/thermoplastic (1)<br>• low melting point (1)<br>• readily available (1)<br>• available in a range of colours (1)<br>• good fluidity properties / easily shaped (1 | (2 X 1) |

| Question Number | Answer | Mark |
|---|---|---|
| **12.** | **Design idea 1**<br><br>Candidates may answer any specification point in either graphical form or by annotation.<br><br>**No marks are awarded for the quality of graphical communication.**<br><br>• Charge two AA batteries at a time (1) e.g. include dimensions sufficient to hold two batteries or show two batteries in position. *(Note: must be different solutions)*<br><br>• allow batteries to be inserted and removed easily (1) e.g. finger slots, low sides, reference to batteries falling out when turned upside-down / strap / pull tab / ejector button / hinged access.<br><br>• Use conductive material to connect to the batteries (1) e.g. brass terminals, copper, stainless steel.<br><br>• Be able to be turned on and off (1): e.g. have a labelled switch, (slide, rocker, push, toggle, PTM, - do NOT accept 'flick' switch).<br><br>• Clearly indicate if it is switched on or off (1): e.g. have an indicator lamp, bulb, LED, LED display, illuminated panel OFF or ON / bi-colour / audible.<br><br>• Clearly indicate the batteries level of charge (1): e.g. moving coil meter, LCD or LED display, LED array, different colour LEDs.<br><br>• Protect the user from mains electricity (1): e.g. fuse, insulation, double insulation, RCD, circuit breaker, earth connection, solar power, battery power.<br><br>• Be capable of being disassembled for recycling (1): e.g. screws, push together / pulled apart, click together, weak adhesive | |

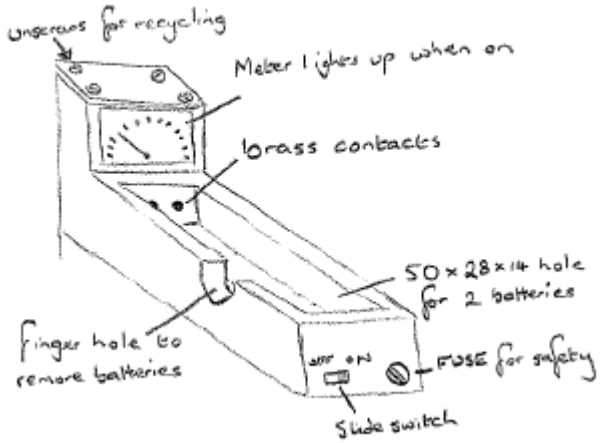
Example of candidate response:




**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:




(2 X 8)

| Question Number | Answer | Mark |
|---|---|---|
| **13(a)** | **Two** explanations from:<br>• Electricity is readily available (1) so lamp can always be used (1)<br>• Mains electricity is economical (1) so is cheaper than other sources (1)<br>• High power is available (1) so light intensity can be greater (1)<br>• Power is constant (1) so performance of lamp does not decline (1)<br>• Batteries would need replacing(1) and create waste / landfill<br>• It does not need to be portable (1) as it is a desk lamp.<br>• Batteries are not powerful enough (1) for a 60W bulb.<br>2 X 2 | (4) |
| Question Number | Answer | Mark |
| **13(b)** | Any **two** from:<br>• Low energy bulb (1)<br>• LED bulb (1)<br>• compact fluorescent bulb (1)<br>• Fit a dimmer 'switch' (1)<br>• Lower powered bulb, (e.g. 60W to 40W) (1)<br>• Turn off when not being used (1)<br>2 x 1 | (2) |
| Question Number | Answer | Mark |
| **13(c)i** | **One** explanation from:<br>• The lamp has moving joints (1) so that it can be adjusted as required (1)<br>• The lamp can be moved on the desk (1) because it is not fixed down (1)<br>2 x 1 | (2) |
| Question Number | Answer | Mark |
| **13(c)ii** | **One** explanation from:<br>• There is a gap round the bulb (1) so that it can be gripped/held easily (1)<br>• The bulb has a screw fitting (1) so can be removed / inserted(1)<br>• No lens / guard (1) so bulb is easily accessed (1)<br>• The bulb can be removed by hand (1) so no tools needed.<br>2 X 1 | (2) |

<table>
<tr><th>Question Number</th><th>Answer</th><th>Mark</th></tr>
<tr><td>13(d) QWC</td><td>
Evaluation to address the following issues:<br><br>
Mild Steel
<table>
<tr><th>Advantages</th><th>Disadvantages</th></tr>
<tr><td>• Low cost material but large investment required in manufacturing equipment.<br>• Reflective so it emits more light<br>• Can be recycled conserving natural resources.<br>• Has a natural silver colour, and can be painted any colour.<br>• Steel withstands heat, so the hot bulb won't damage the reflector.<br>• Steel is tough and durable, so it is unlikely to break, and can still be used even if it is dented.</td><td>• Conducts electricity, which could give the user an electric shock if there is an electrical fault.<br>• Requires painting, lacquering or galvanising to avoid oxidisation/ rust<br>• Steel is a good conductor of heat, so the user could burn themselves when the reflector gets hot from the heat of the bulb.<br>• Thin material has sharp edges which need protection.</td></tr>
</table>
Acrylic
<table>
<tr><th>Advantages</th><th>Disadvantages</th></tr>
<tr><td>• Acrylic is available is a wide range of colours/effects.<br>• Acrylic is easily formed (by casting or drape-forming) without high</td><td>• Acrylic is a thermoplastic, so could deform when heated by the hot bulb.<br>• It's a brittle material, so could easily</td></tr>
</table>
</td><td></td></tr>
</table>

| | | | |
|---|---|---|---|
| | capital investment.<br>• Can be recycled conserving natural resources<br>• Surplus materials and reject items can be recycled in-house.<br>• It's an electrical and thermal insulator, so the user will not receive an electric shock or burn. | crack (leaving sharp /dangerous edges).<br>• The material cost is quite high.<br>• Material has a 'cheap' image which may put off potential customers. | |
| | *For full marks, candidate must discuss **both** materials.* | | (6) |

| 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 |
|---|---|---|
| **14a(i)** | OR | 1 |

| Question Number | Answer | Mark |
|---|---|---|
| **14a(ii)** | <table><tr><th>Input 1</th><th>Input 2</th><th>Output</th></tr><tr><td>0</td><td>0</td><td>**0**</td></tr><tr><td>0</td><td>1</td><td>**0**</td></tr><tr><td>**1**</td><td>**0**</td><td>**0**</td></tr><tr><td>**1**</td><td>**1**</td><td>**1**</td></tr></table> ***One mark for each correct row*** 4 X 1 | (4) |

| Question Number | Answer | Mark |
|---|---|---|
| **14a(iii)** | Any **two** from;<br>• A low resistance from the variable resistor (1) and a high resistance from the LDR (1)<br>• The voltage across the LDR is greater (1) than that across the variable resistor (1)<br>• When darkness falls the LDR's resistance will increase (1) to be greater than the variable resistor (1)<br>• When darkness increases voltage rises (1) and gives a signal input to input 4 (1)<br>• A potential divider (1) gives a voltage that would change at input 4 (1)<br>• The LDR (1) will vary in resistance / voltage (1)<br>2 X 1 | (2) |

| Question Number | Answer | Mark |
|---|---|---|
| **14a(iv)** | **One** description from:<br>The weak signal (1)is connected to a transistor /thyristor /FET /Darlington pair /power transistor / relay(1) | (2) |

| | | |
|---|---|---|
| | 2 X 1 | |
| Question Number | Answer | Mark |
| **14(b)** | Any **one** from:<br><br>**Advantage**<br>• High speed process (1)<br>• Accurate (1)<br>• non-contact method (1)<br>• suited to automation / CAM (1)<br>• suited to high volume/ multiple copies(1)<br>• Low unit cost (1)<br>• Circuit could be very compact (1)<br><br>**Disadvantage**<br>• Requires hazardous chemicals / UV light (1)<br>• wastes copper (1)<br>• slow for one-off processes (1)<br>• not flexible/adjustable (1)<br>• Requires expense equipment / chemicals (1) | (2) |

**14(c)**

Evaluation to address the following issues:

**Simulation Software**

| Advantages | Disadvantages |
|---|---|
| • Editing and updating can be done very rapidly.<br>• Files can be sent very rapidly as attachments to staff in other offices around the world<br>• Files can be interfaced with CAM machines<br>• Software can predict problems, currents, voltages, etc.<br>• Neat diagrams easily understood<br>• 'building blocks' enable faster drawing.<br>• Can see circuit working on the screen to enable virtual testing.<br>• Can automatically generate PCB masks saving development time. | • The initial setup costs, (hardware, software, training) are very high<br>• Different users need to use compatible software<br>• Software may not include all possible components<br>• Computer can crash and lose work<br>• Auto routing isn't perfect, requiring manual completion. |

6 X 1

**Paper and Pen**

| Advantages | Disadvantages |
|---|---|
| • Easy to learn how to use and can be used anywhere.<br>• The drawing is easily edited saving time and effort.<br>• No specialist resources are required, saving initial cost.<br>• The scope of the work is limited only by the knowledge of whoever's doing the work | • No automatic checking possible / human errors can occur.<br>• Errors are very easy to make<br>• It is difficult to integrate with other equipment/people, or to modify or develop the work.<br>• Component sizes are not known making scaling difficult. |

6 X 1

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No rewardable material |
| 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. |
| Level 3 | 5-6 | Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues. 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(d)** | **One** explanation from:<br><br>• It enables automatic stock control (1) so that stock levels can be monitored (1)<br>• It monitors stock levels (1) so that automatic reordering can take place (1)<br>• Sales data can be collected (1) so that customer preferences can be identified (1)<br>• It is much quicker at the till (1) because information is gathered automatically (1)<br>• Less chance of errors (1) because of reduced human input. | (2 X 1) |

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Rewarding Learning