Mark Scheme (Results)

Summer 2015

Pearson Edexcel
GCSE in Electronic Products
5EP02/01

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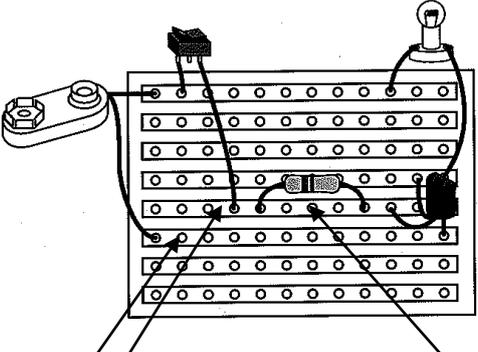**General Marking Guidance**

- 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	A	**1**

Question Number	Answer	Mark
2	D	**1**

Question Number	Answer	Mark
3	C	**1**

Question Number	Answer	Mark
4	C	**1**

Question Number	Answer	Mark
5	B	**1**

Question Number	Answer	Mark
6	C	**1**

Question Number	Answer	Mark
7	A	**1**

Question Number	Answer	Mark
8	A	**1**

Question Number	Answer	Mark
9	B	**1**

Question Number	Answer	Mark
10	D	**1**

Question Number	Answer	Mark
11. (a)(i-iv)	<table><tr><td rowspan="1">Photovoltaic cell</td><td>**(i)To generate power/electricity/energy from sunlight/light**</td></tr><tr><td>Line Bending</td><td>**(ii)To bend plastics/thermoplastics**</td></tr><tr><td>**(iii)Diode**</td><td>Allowing current to flow in one direction only</td></tr><tr><td>**(iv) Solenoid**</td><td>Converts electric current to straight line movement</td></tr></table> **4 x 1**	**4**
11b(i)	(i) R1 goes between these 2 arrows (ii) Track break here or one hole to the left or right One leg of the resistor in the bottom track (1) A leg in the second track up (1). (Their position to the left/right will have no impact). **2 x 1**	**2**
11b(ii)	X is between the two legs of resistor R2. (1) **1 x 1**	**1**
11b(iii)	Any **one** of: - Editing/correcting is faster - Can use component library - Can save/email circuits - Can test/simulate the circuit - Looks neater than hand-drawn - Can export to track-design software **1x 1**	**1**
11c(i)	It is faster to construct **(1)** No drilling required **(1)** No chemicals needed **(1)** A one off circuit **(1)** **1x 1**	**1**
11c(ii)	Any **two** of: It protects the transistor **(1)** from excessive current **(1).**	

	It limits the current to the transistor **(1)** which prevents damage to the transistor **(1)** **2 x 1**		**2**
11(d)	Any **four** from: - Prepare the mask (1) - Cut board to size (1) - Peel protective layer from board (1) - Put mask/acetate over board (1) - Put mask and board in lightbox (1) - Put board in developer/sodium hydroxide (1) - Rinse the board (1) - Put board in etch tank (1) - Mention of ferric chloride or sodium persulphate (1) - Remove board when etched (1) - Rinse board (1) - Clean with wire wool/PCB rubber/polishing block (1) Responses may be in any order. "Rinse the board" can only be credited once. (No marks for 'acid') **4 X 1**		**4**
11(e)	Any two of: - Smaller circuits (1) allows for smaller products (1) - Lower costs (1) enable greater profits (1) - Can be assembled by robots (1) reducing the wages bill(1) - Permanently soldered components (1) can't come out (1) - Breadboard is designed to be temporary (1) and is not reliable in the long term (1) - Can produce multiple boards (1) so more are produced in a shorter time (1) **2 x 2**		**4**
Question Number	Answer		Mark

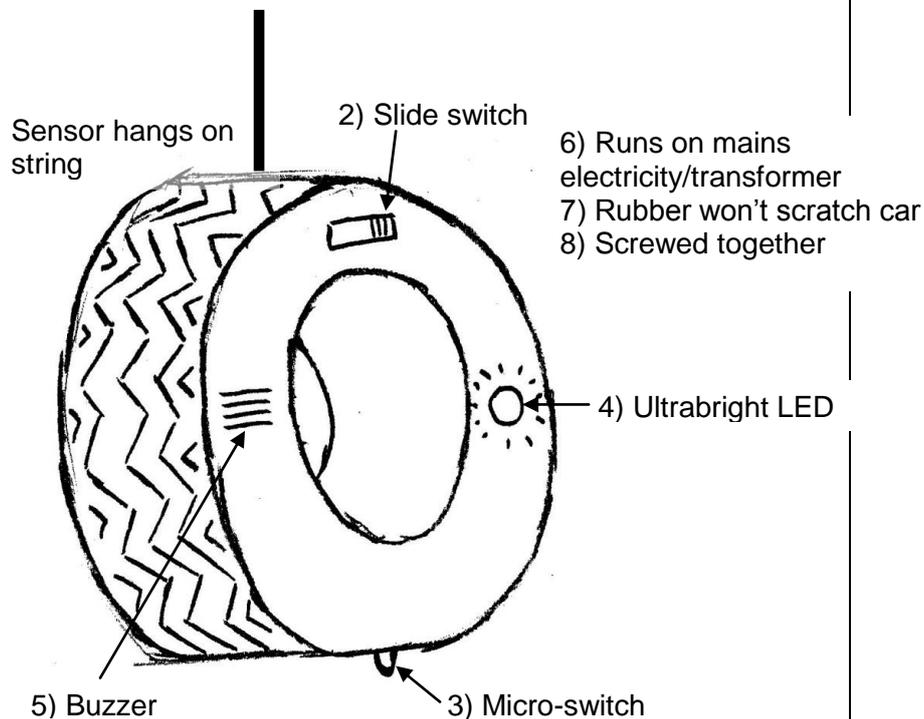| 12. | **Design idea 1**
Candidates may answer any specification point in either graphical form or by annotation.
No marks are awarded for the quality of graphical communication.
• have a 'motoring' theme **(1)**: e.g. cogs, car shapes.
• have a named switch **(1) :** e.g. rocker, toggle
• electronically sense the position of the car **(1) :** e.g. reed switch, light beam, infra red.
• have a visual warning **(1) :** e.g. lamp, LED
• have an audible warning **(1) :** e.g. buzzer, bell
• have a suitable power supply **(1) :** e.g. solar cell, named batteries
• be made from a material that will not damage the car **(1) :** e.g. HIPS, rubber
• be permanently sealed so children cannot open it **(1) :** e.g. glued, screwed

2 x 8 | **16** |
| | | |

Example of candidate response:

Sensor hangs on string

2) Slide switch

6) Runs on mains electricity/transformer
7) Rubber won't scratch car
8) Screwed together

4) Ultrabright LED
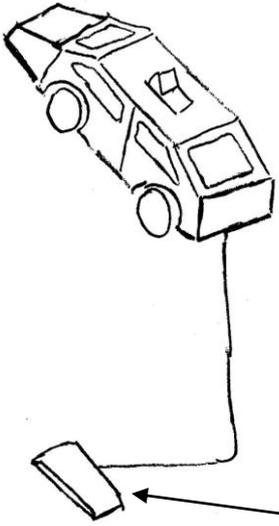
5) Buzzer   3) Micro-switch

Design idea 2

Marks for design idea 2 can only be awarded where specification points are resolved differently than in design idea 1.
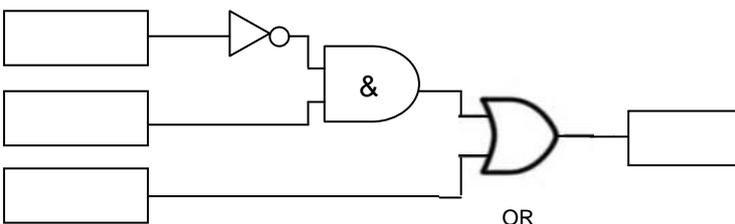
Example of candidate response:

2) rocker switch

Sensor on floor, display on wall.
4) Flashing lamp inside car design
5) Hidden speaker inside car
6) Uses rechargeable batteries
7) Made from acrylic
8) Glued together with Tensol

3) car runs over PTM switch

Question Number	Answer	Mark
13a(i)	Any **one** of: Large numbers (1) are very clear (1) LCD display (1) has clear contrast(1) Numbers (1) are easier to read than a 'pointer'/moving coil meter(1) Mix & match if appropriate **2 x 1**	**2**

Question Number	Answer	Mark
13a(ii)	Any **one** of: Rubber sucker (1) works underwater(1) Rubber sucker (1) adheres securely to glass (1) **2 x 1**	**2**

Question Number	Answer	Mark
13(b)	Any **two** of: They are small (1) so take up little space (1) They are self-contained (1) so need no cables (1) They provide enough energy (1) because LCDs use little power (1) They are readily available (1) so can be replaced easily(1) They are cheap (1) which makes the product more attractive to customers (1) **2 x 2**	**4**

Question Number	Answer	Mark
13(c)	Any **two** of: So that different parts can be sorted(1) for recycling (1) So parts may be re-used (1) in new products (1)	

	To enable repair (1) so it will last longer (1) So materials/components can be sold (1) as they have value (1) Do not allow 'cheap'. <mark>Check at pre-standardisation – are these responses rigorous enough?</mark> **1 x 2**	**2**
Question Number	Answer	Mark
13. (d) **QWC**	**Evaluation to address the following issues:** **User Requirements:** <table><tr><td>LCD</td><td>LED Dot Matrix</td></tr><tr><td>Shock resistant so unlikely to break under normal use</td><td>High cost will make product more expensive</td></tr><tr><td>Small, allowing smaller products to be produced</td><td>Very bright so easy to read from a distance</td></tr><tr><td>Available in many colours for a more attractive display</td><td>Easier to repair than LCD because of less complex circuitry</td></tr><tr><td>Small pixels enables high resolution images</td><td>Low resolution because of size of LEDs</td></tr><tr><td>Low power consumption gives longer product life</td><td>Higher power requirement but gives brighter output</td></tr><tr><td>Narrow viewing angle limits ability to read display</td><td>LEDs emit light so no back lighting required</td></tr></table> **6 x 1**	**(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)	Using the internet to tell/inform/communicate with (potential) customers about a product (1). Accept any appropriate response **1X1**	**1**

Question Number	Answer	Mark
14a(ii)	Any two of; **Advantages:** • It's low cost (1) as no printing is required (1) • It's global (1) so advertises to people who are far away (1) • It's low cost (1) as it can be produced from any geographical location to fit their needs (1) **Disadvantages:** • Not everyone has the internet (1) so can't reach some potential customers (1) • Some people like to speak to a person (1) which limits the effectiveness of the marketing (1) **2X2**	**4**

Question Number	Answer	Mark
14(b)	 Award one mark for each correct logic symbol, and one mark for correctly arranging/connecting them. **4 X 1**	**4**

Question Number	Answer	Mark
14(c)i	Any **two** of: The output of the chip(1)	

	Connected as a monostable device (1) Is connected to the pump (1) Through a relay/transistor/ any amplifying device (1)	
	2X1	**2**
Question Number	Answer	Mark
14(c)ii	Resistor/Variable resistor/ preset resistor/ potentiometer (1) Capacitor/ Electrolytic capacitor (1)	
	2 x 1	**2**
Question Number	Answer	Mark
14(d) QWC		

Logic gates	PICs
Pre-programmed so less time required to make circuit operational	Requires programming which takes time/ requires appropriate hardware & software
Chip can only do one job: require more of them so the circuit is larger	Chip can do different tasks: can be reused in different circuits
Faster than PICs as faster switching speeds.	Slower than logic as more complicated- limits operating speed
Function is set for the life of component so cannot be adapted	Function can be changed as required to correct errors
Digital only restricts applications	Digital or analogue so can attach a range of sensors to inputs
Cheaper per unit but will require more for complex functions	More expensive per unit but flexible and can perform complex functions
More useful for simple operations	Can use multiple inputs and has multiple outputs

Award one mark for each correct point to a maximum of **6**. However, award a maximum of **5** marks if all responses come from the same column.

6X1 — **6**

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.