



General Certificate of Education

**Design and Technology
(Electronic Products)**

Foundation (3541)

Final Version

Mark Scheme

2008 examination - June series

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Question 1

- (a) Two different features with appropriate matching reason.
- Feature – Reason, e.g.
- On / off switch - triggers the device
- Battery powered - portable / placed anywhere
- Waterproof – so can be used in all weather conditions
- | | | |
|-------------------------------------------|------------|-----------|
| Have LEDs which flash - attract attention | 2 x 1 mark | |
| | 2 x 1 mark | (4 marks) |
- (b) Qualified response, e.g.
- Visit local car parts store (Halfords) make notes on features of products
- Simple response, e.g.
- Visit local car parts store (Halfords)
- Second method must be different, possible responses are:
- Search for information on Internet via on line shops ('research on internet' only 1 mark)
- | | | |
|------------------------------------------------|------------|-----------|
| Survey motorists to see what products are used | 2 x 1 mark | |
| | 2 x 1 mark | (4 marks) |
- | | | |
|--------------|----------------|--|
| Total | 8 marks | |
|--------------|----------------|--|

Question 2

(a)	Specific name of a suitable material (e.g. acrylic, HIPS, Aluminium, Mild steel, etc.)	2 mark	
		Or	
	General material (metal or plastic)	1 mark	
	Clear design which increases base size or base weight to make stable	2 marks	
		Or	
	Limited detail to the design	1 mark	
(b)	Feasible design, either through notes or sketches, which shows how it is suitable for storing in the car	2 marks	
		Or	
	Limited detail in the design	1 mark	(6 marks)
	LEDs in visible position	1 mark	
	Not at edge	1 mark	
	An appropriate method of holding the LED – clip, bezel, etc.	2 marks	
		Or	
	Or Interference fit	1 mark	
	Appropriate position of switch	1 mark	
	Detail of how fitted in the case	1 mark	
	Method of accessing the case	1 mark	
	Access to the case is secure	1 mark	
	All materials and components labelled	2 mark	
		Or	
	Some materials and components labelled	1 mark	(10 marks)
QoC	Clear, detailed sketch(s) with full annotation	3 marks	
	Clear sketch(s) with some annotation	2 marks	
	Limited detailed	1 mark	(3 marks)
		Total	19 marks

Question 3

(a)	(i)	B	1 mark	
	(ii)	C	1 mark	
	(iii)	A	1 mark	
	(iv)	F	1 mark	(4 marks)
(b)	(i)	LED or Light Emitting Diode	1 mark	
	(ii)	Thermistor	1 mark	
	(iii)	Fuse	1 mark	
	(iv)	Thyristor	1 mark	(4 marks)
(c)		AND Gate / AND / and	1 mark	(1 mark)
(d)	(i)	Output	1 mark	
	(ii)	Process	1 mark	
	(iii)	Output	1 mark	
	(iv)	Input	1 mark	(4 marks)
			Total	13 marks

Question 4

- | | | | |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------|
| (a) | Clear correct response, e.g.

Component has positive / anode and negative / cathode legs and must be connected correct way round in the circuit | 2 marks | |
| | Simple answer, e.g.

Has polarity; must be right way round | 1 mark | (2 marks) |
| (b) | Cathode | 1 mark | |
| | Anode | 1 mark | (2 marks) |
| (c) | Band shown at top of cylinder (arrow end) | 1 mark | (1 mark) |
| (d) | Full answer, e.g.

The diode only allows current one way therefore can be used to prevent damage from wrong battery connection.
Can prevent back e.m.f. damaging transistors when using an electromagnetic device | 2 marks | |
| | Simple answer, e.g.

Protects components or only allows electricity one way | 1 mark | (2 marks) |
| (e) | 1 mark per relevant response

e.g.

SW1 allows power to the circuit

SW2 triggers the thyristor

Thyristor latches

Thyristor switches buzzer on

2K2 Resistor limits voltage

1K Resistor stops thyristor resetting | 4 x 1 mark | (4 marks) |
| | | Total | 11 marks |

Question 5

- | | | | |
|-----|--------------------------------------------------------------------------------------------------------------------------------------|---------|-----------|
| (a) | Pin 7 to between R1 and R2 | 1 mark | |
| | Either | | |
| | Pin 2 and 6 joined together | 1 mark | |
| | Pin 2/6 to between R2 and C1 | 1 mark | |
| | Or | | |
| | Pin 6 to between R2 and C1 | 1 mark | |
| | Pin 2 to between R2 and C1 | 1 mark | (3 marks) |
| (b) | Add a variable resistor / potentiometer in series with R1 / R2 | 2 marks | |
| | Replace R2 or R1 with a variable resistor or add variable resistor | 1 mark | (2 marks) |
| (c) | Formula: $V = I \times R$ | 1 mark | |
| | Formula re-arranged: $R = V / I$
(if put straight down or 'triangle', 2 marks) | 1 mark | |
| | Substitute values: $R = 9 - 2V / 20 \text{ mA}$
(if $R = 9 / 20$ is 0 marks, but give credit for correct calculation to show 450) | 1 mark | |
| | Answer = 350 | 1 mark | |
| | Units – Ohm or Ω or R | 1 mark | (5 marks) |
| (d) | Explanation | | |
| | Different voltage or current | 1 mark | |
| | Between Pin 3 and supply voltage | 1 mark | |
| | Modification | | |
| | Change value of resistor | 1 mark | |
| | Lower the value in the resistors going to 0V | 1 mark | (4 marks) |

Total 14 marks

Question 6 (com)

(a)	(i)	Pin 16 to 9V line	1 mark	
		Pin 8 to 0V line	1 mark	(2 marks)
	(ii)	LED 1 to pin 2	1 mark	
		LED 2 to pin 4	1 mark	
		LED 3 to pin 7	1 mark	
		LED 4 to pin 10	1 mark	
		LED 5 to pin 1	1 mark	(5 marks)
	(iii)	Pin 5 to pin 15	1 mark	(1 mark)
	(iv)	Astable Output to pin 14	1 mark	(1 mark)
	QoD	Clear lines and connections	1 mark	(1 mark)
(b)		Pull down resistor keeps pin 15 low or at 0Vs	1 mark	
		Until pin 15 receives a high signal		
		Or		
		Stops pin 15 floating and triggering falsely	1 mark	
		Or words to that affect		(2 marks)
			Total	12 marks

Question 7

- | | | | |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------|
| (a) | Top row horizontally | 1 mark | |
| | Vertical columns above centre line | 1 mark | |
| | Vertical columns below centre line | 1 mark | |
| | Bottom row horizontally | 1 mark | (4 marks) |
| (b) | Break between columns | 1 mark | |
| | Correct spacing for an I.C. / chip | 1 mark | (2 marks) |
| (c) | Marks can only be awarded for reference to breadboard advantages and disadvantages | | |
| | 2 different advantages, e.g. | | |
| | <ul style="list-style-type: none"> • Low start up costs • Can be used anywhere • Become familiar with actual components • Tests circuits in a real life situation | 2 x 1 mark | |
| | 2 different disadvantages, e.g. | | |
| | <ul style="list-style-type: none"> • Components can be damaged • Fiddly to connect • Connections can become unreliable • Need to have components to test circuit idea • Limited to available components | 2 x 1 mark | (4 marks) |

(d) Reasons must be different

Qualified response, e.g.

- Changes can easily be made without having to redraw the whole circuit
 - Designs can be shared electronically quickly and easily
 - Very accurate for spacing of legs / components
 - Easy to make neat and compact
- 3 x 2 marks

Simple response, e.g.

- Easy to change
 - Accurate
 - Neat
 - Sharing
- 3 x 1 mark (6 marks)

Easy to use is not an acceptable response

Total 16 marks

Question 8

- (a) Below is an example of the steps involved in the process:
- | | | |
|---------------------------------------------------|--------|-----------|
| Mould on platten | 1 mark | |
| Plastic clamped in place | 1 mark | |
| Heater moved in place | 1 mark | |
| For suitable time 30 – 45s or by state of plastic | 1 mark | |
| Mould and plastic together | 1 mark | |
| Vacuum pump switched on | 1 mark | |
| Vacuum pump off and mould / plastic separated | 1 mark | (7 marks) |
- Mark deducted if incorrect sequence.
- (b) Appropriate material, e.g.
- HIPS
 - Acrylic
 - Polystyrene
 - ABS
 - FoamPVC (Foamex)
- 2 marks
- Generic material, e.g.
- Plastic
- 1 marks (2 marks)
- (c) Issue related to dust when cutting / sawing / drilling MDF
- 1 mark
- Appropriate safety measure and its effect – extraction, mask, goggles
- 1 mark
- Issue related to sanding / finishing MDF
- 1 mark
- Appropriate safety measure and its effect – extraction, mask, goggles
- 1 mark (4 marks)
- Total 13 marks**

Question 9**(a) Quality of response answer:**

Detailed response considering both positive and negative aspects 4 to 6 marks

Limited response or a response to only one aspect 1 to 3 marks

Examples of possible suggestions:

Positive points

- Improve road safety
- Reduce speed / maintain speed limits
- Help prevent accidents
- Reduce injuries in accidents
- Prevent accident black spots

Negative points

- Perceived as threatening by motorists
- Can distract drivers
- Causes anxiety / stress in drivers
- Cost of installation & use
- Excessive braking
- Less police patrol cars on the road
- Less chance of catching serious incidents, e.g. drink driving

(6 marks)

(b) Quality of response answer:

Detailed response suggesting innovative uses of technology 4 to 6 marks

Limited response 1 to 3 marks

Examples of possible suggestions:

- Cameras to replace mirrors – reduced size reduced drag
- Multiple cameras looking down and back on each door
- Rear view camera to see behind trailer unit – a major blind spot
- Monitor on dashboard showing multi-screen images
- Heads up display on wind screen in front of driver
- External links of camera images – better security / safety

(6 marks)

Total 12 marks

Question 10

(a) Programme can be changed / programmable

Less components required

Less soldering / quicker to make PCB

Smaller PCB required

Simplification of circuit

3 x 1 mark (3 marks)

Easy to use not an appropriate response

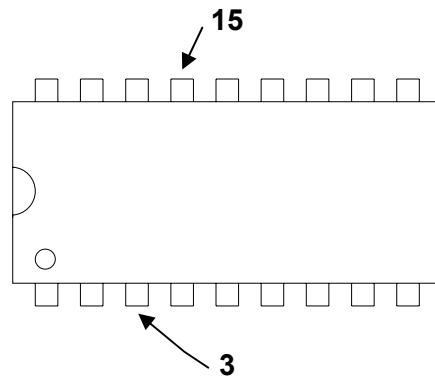
(b) 3V to 5.5V

1 mark (1 mark)

(c) 8 pins

1 mark (1 mark)

(d)



2 x 1 mark (2 marks)

Total 7 marks

Total for Paper 125 marks