

# ResultsPlus

Examiners' Report

June 2011

GCSE Design & Technology:  
Electronic Products 5EP02 01

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## **Introduction**


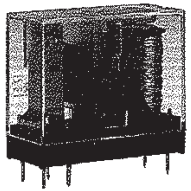

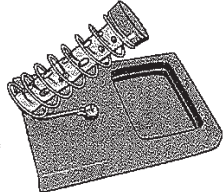
This examination explored topics from across the range and breadth of the Electronic Products specification, enabling candidates to demonstrate their knowledge and understanding throughout the paper. Despite this being the first year of entry for many centres, candidates are clearly being well prepared for this examination with candidates appearing confident across the variety of questioning techniques, (short, medium and long answer). Although the paper is 'ramped', it was pleasing to see virtually no students giving up mid-script, enabling all candidates to access at least some of the easier marks in the final questions. It was encouraging to see very few candidates leaving questions unanswered, and there were many instances of 'lucky guess' responses which achieved marks.

More detailed feedback concerning responses to individual questions is given on the following pages of this document.

Q11(a). The first two questions were often poorly responded, with many candidates suggesting that energy can be created and that relays move things around a circuit. Virtually all candidates recognised the loudspeaker and soldering iron holder.

11 (a) The table below shows some tools and components.

Complete the table by giving the missing names and uses.

Tools/Components	Name	Use
	Solar cells	generating current using sunlight ✓ (1)
	Relay	Switch used to turn on a large current from a small input current ✓ (1)
	Speaker ✓ (1)	To convert electrical energy to sound
	Soldering Iron holder ✓ (1)	To hold a soldering iron safely



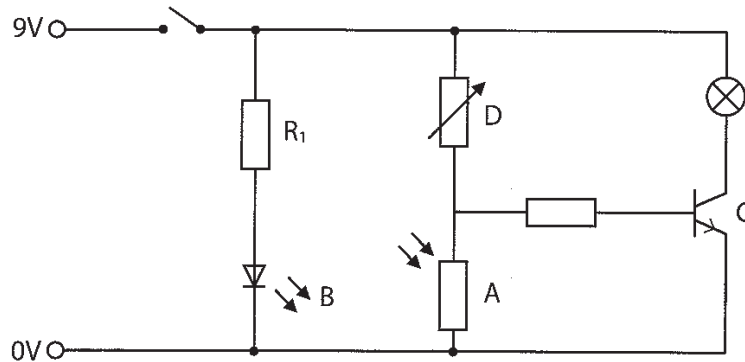
**ResultsPlus**  
Examiner Comments

This candidate clearly understands the components and tools illustrated and gives a clear description of each one, displaying good subject knowledge.

Q11(b) This question was very well addressed, with almost 100% accuracy from all students.

Q11(c) While most candidates discussed that the variable resistor controlled current or voltage, few made the link to explaining that it was the sensitivity of the circuit that was controlled; most suggested it was the brightness of the bulb.

(b) A student is making a nightlight. This is a circuit that will automatically switch a lamp on when it becomes dark. The circuit is shown below.



Name the components labelled **A**, **B** and **C**.

A LDR - light dependent resistor ✓ (3) 3  
B LED - light emitting diode ✓  
C Transistor ✓

(c) Component **D** is a variable resistor.

Describe the purpose of component **D** in this circuit.

(2) 1  
Component D can be manually adjusted by the student to change the input required to switch on the transistor. If resistance is decreased in D, then light LED is switched on with more light & vice versa.



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Examiner Comments

Although this candidate does not use the term 'adjusting sensitivity', they clearly understand the concept, and so have realised both available marks.

Q11(d) The purpose of this question was to identify if candidates were aware that 'm' means 10<sup>-3</sup>. Most responses included 3.5, 35 or 350, most included ohms or K, but the main errors were in thinking that 2mA is 0.02A.

(d) Use the formula  $R = \frac{V}{I}$  to calculate the resistance of R1 when 7 volts across it gives a current of 2 mA. Remember to include the units in your answer.

$$R = \frac{7}{0.02} = 350 \Omega \quad (3) \quad 2$$



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Examiner Comments

This typical response illustrates that the candidate can manipulate figures and knows the units of resistance, but has written 2mA as 0.02A rather than 0.002A.



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Examiner Tip

You'll always get a mark for putting the correct units.

Q11(e) This question was a very good differentiator between stronger candidates and those with a less secure understanding of how technology is used. More able candidates are able to qualify their responses and give sufficient detail, e.g. disposable batteries are not cheaper than solar power, but they are cheaper initially. Many candidates suggested that being able to replace batteries was an advantage.

(e) The nightlight could be powered by solar power (with storage batteries) or by disposable batteries.

Give **one** advantage and **one** disadvantage of these power sources for the nightlight.

(4) 3

Disposable Batteries – Advantage

Cheaper to buy than <sup>using</sup> solar power X

Disposable Batteries – Disadvantage

Use non-renewable resources so they are unsustainable

Solar power – Advantage

renewable and sustainable form of energy

Solar power – Disadvantage

dependant on sunlight

(e) The nightlight could be powered by solar power (with storage batteries) or by disposable batteries.

Give **one** advantage and **one** disadvantage of these power sources for the nightlight.

(4) 2

Disposable Batteries – Advantage

The batteries do not require being recharged.

Disposable Batteries – Disadvantage

Once used up, it has to be replaced. This may be expensive.

Solar power – Advantage

If it runs out of power, place it in the light to recharge.

Solar power – Disadvantage

Will not work if it runs out of power and there is no light.



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Examiner Comments

Comparing these two examples illustrates the clarity of higher responses against the vagueness or inaccuracies of poorer responses.

Q11(f) It was pleasing to see students with such a good understanding of environmental issues. This question was almost universally correctly given as carbon dioxide, while most candidates suggest that products (mainly cars) are used less or made more efficient. The main error was in suggesting electric or hydrogen cars, and although these are more efficient than internal combustion engines, they employ energy storage devices rather than primary energy sources.

(f) The Kyoto Protocol is an international agreement to limit the emission of greenhouse gases.

(i) Name the main greenhouse gas that the Kyoto Protocol aims to control.

(1) /

carbon dioxide ✓

(ii) State **two** ways in which the emission of greenhouse gasses could be reduced.

(2) /

- 1 Less cars using petrol and diesel, and instead using fuel cells X
- 2 Using nuclear power instead of coal or fossil fuels.



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**Examiner Tip**

Don't say the same thing twice for (1) and (2).



Question 12. Centres are now familiar with the format of this question and although there are now eight single points rather than four points requiring qualification, candidates have clearly been briefed on how to respond to each specification point in turn. Most designs were marked as attractive to children, with many candidates writing 'made in bright colours' to get round the prohibition on multicoloured response. Common errors in this question include a repetition of the same solution in both designs, e.g. two LEDs to indicate that power is on, and a lack of detail, e.g. batteries rather than AAA batteries.

**Design idea 1**



It is made out of high impact polystyrene (HIPS) which is vacuum formed to this appropriate shape using a pre-made wooden mould

This is a green LED this is solid and bright when the circuit is turned on

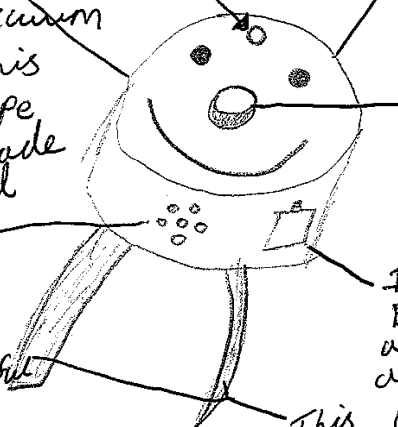
This design is made from a blue case, a unisex colour to appeal to all children and also has a smiley face which will be attractive to children

These are holes which allow the noise from the small but powerful speaker to be heard loud and clearly.

This is a Rocker Switch which will turn the alarm on and as this single pole single throw switch mechanism

It is powered by 2 'AA' Batteries which are kept behind a screwed lid to prevent children accessing them

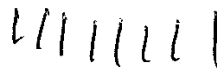
This uses velcro straps so it can be securely attached to the child's arm. (8)



**Design idea 2**

It is made using acrylic, and the 90° angles are created using wire bending multiple parts are made then glued together using acrylic cement.

The buzzer is situated on one outside of the case to make its sound as loud and attention grabbing as possible



The casing is striped in multiple different colours to look attractive to children this striped effect would be created by using a striped acrylic, it is a ~~cube~~

It is powered by a solar cell that covers the entire side, this charges storage batteries so it can be used when it's dark and sunny this makes it self sufficient

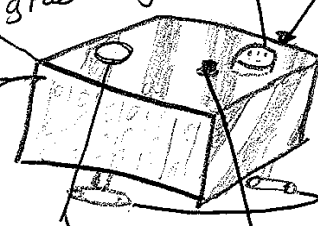
This is clear acrylic which allows the light from one light bulb to be seen when this is on it indicates that the circuit is 'powered on'

It has 2 cloth pins so it can be easily and securely attached to the child's clothing

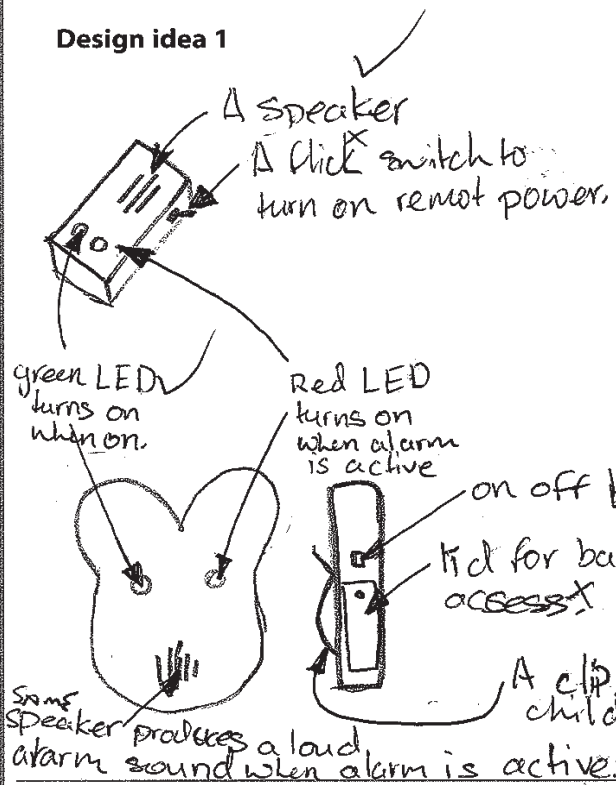
It uses a PTM (push to make switch) to turn alarm on and off

16/ (8) 16

(Total for Question 12 = 16 marks)

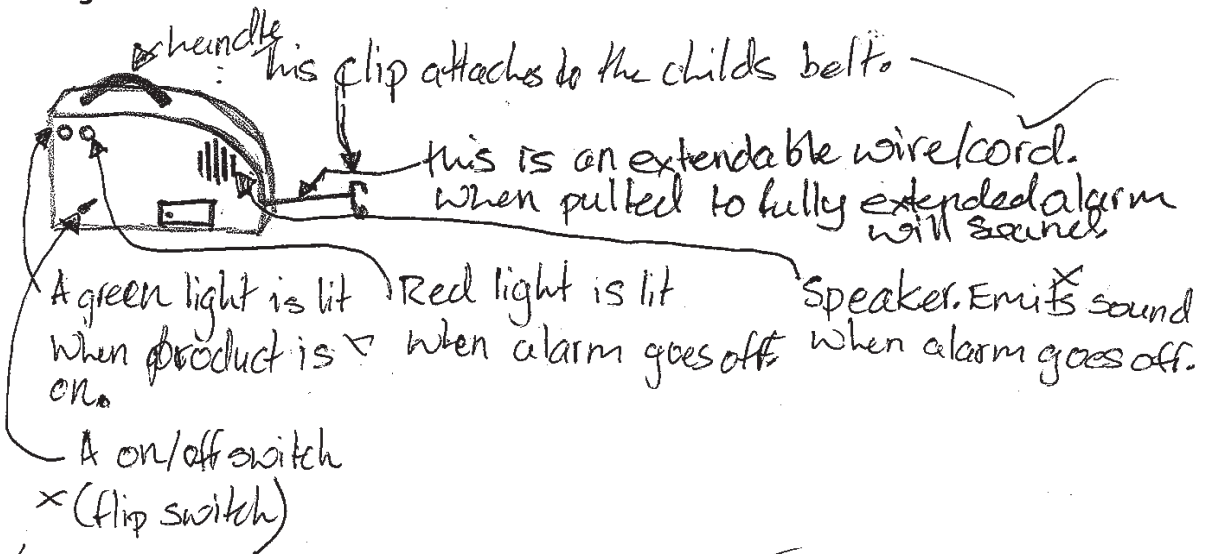


**Design idea 1**



This product will be made out of ~~GIP~~ or high impact polostyrene. We would vaccum form the case using a mould. The case resembles a toy wich attracts children. It also has a clip to fix onto the childs clothing. a loud noise/alarm will be emitted from both remote 7 and case when needed.

**Design idea 2**



This product will be made from acrylic as it comes in a wide range of colours. It will be made using vacuume 2 forming when the extendable cord is completely extended the alarm sounds.

(Total for Question 12 - 9 marks)

(9)



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Examiner Comments

In the first example, the candidate has achieved full marks. Although the response is very wordy, we see details such as AA batteries/solar cell, rocker switch/PTM switch, acrylic/HIPS, etc. The second candidate has presented a strong first design with the exception of 'battery' rather than a specific type of battery. However, their second drawing mentions lights, flip switches and repeats vacuum forming, achieving only an additional two marks.

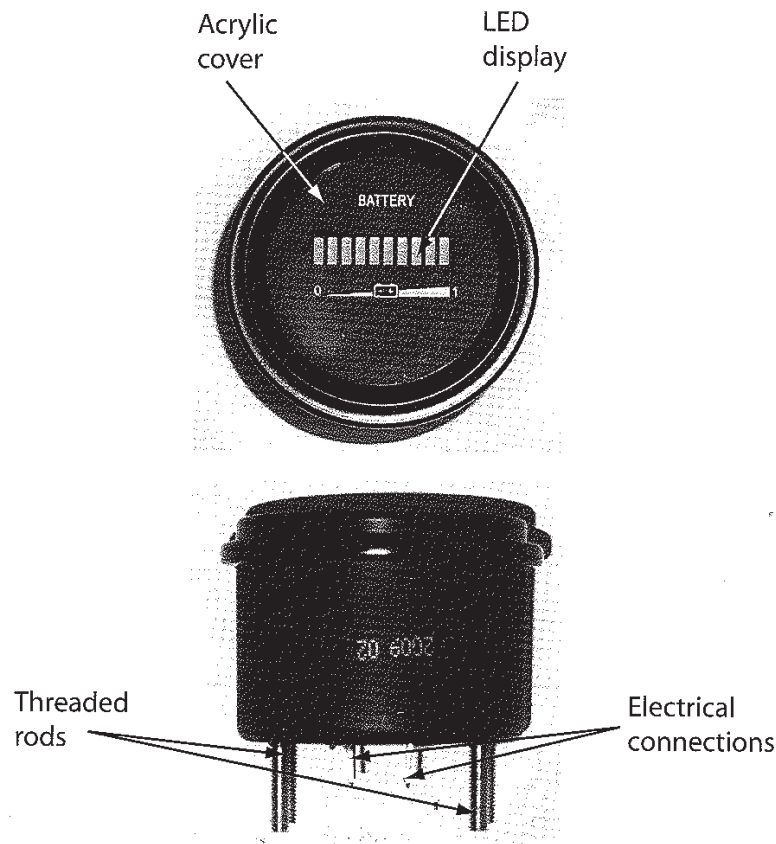


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Examiner Tip

Make sure your drawing and/or annotation clearly addresses every point on the specification - try ticking them off one-by-one. Make sure every point on drawing two is different to drawing one.

Q13(a) The best responses referred to the environment in which the display would be used, e.g. can be read at a glance, and won't bounce around like a moving coil meter.

13 The pictures below show a battery condition indicator which uses an LED display. It is used in electrically powered vehicles to indicate how much energy remains in the batteries.



(a) Give **two** advantages of an LED display compared with other forms of visual indication.

(2)

1 LED displays do not require much power to use ✓

2 LEDs offer a clear display at all light-levels ✓



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Examiner Comments

This candidate has achieved both available marks by identifying two relevant points.

Q13(b) While many candidates could suggest appropriate properties of acrylic, it is disappointing to see the same vague terms being used, i.e. cheap, strong, efficient, quick to manufacture..... Candidates must be aware that rephrasing the question will not achieve marks.

(b) The LED display is protected by a clear acrylic cover.

Give **two** features of acrylic that make it suitable for making the cover.

For each feature, justify your answer.

(4)

Feature 1

Acrylic is strong

Justification

If the battery condition indicator is struck, the Acrylic will not crack or dent.

Feature 2

Lightweight

Justification

The clear acrylic offers protection whilst minimally increasing overall weight of the product



### ResultsPlus Examiner Comments

This response is only worth one mark, the second point suggests durability. 'strong' is too vague, 'lightweight' is not a relevant property for this situation, and 'offers protection' is a rewording of the stem 'the LED display is protected by a clear acrylic cover'.

Q13(c) (i) and (ii) While candidates could invariably identify the relevant features of the indicator; few could achieve the second mark by explaining how that feature enabled the product to satisfy the specification point. Some candidates were mentioning two points but failing to achieve the second mark because neither point was explained.

(c) Explain how the battery condition indicator is successful in meeting the following specification points:

(i) The driver has a clear indication of how much energy remains in the battery.

(2) 1

It has 10 visible LED sections that light up depending on the amount of energy in the battery for example 5 LEDs are on which means the battery is half charged.

(ii) The indicator can easily be inserted into a car dashboard.

(2) 1

The rods are threaded making it easy to fix/screw on and the electrical connections are protruding making it easy to connect up to the car.



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#### Examiner Comments

The candidate discusses that the display is clear, that the number of LEDs relates to the state of the batteries, that there are electrical connections and that they can be connected to, thereby achieving all four available marks.

Q13(d) As we saw in question 11(f), it was pleasing to see candidates using their knowledge from other areas of the curriculum to achieve marks here. Most candidates identified that wind and solar radiation are variable power sources, while more able candidates would discuss visual and noise pollution, the availability of small solar panels but not small wind turbines and so on. Some candidates made the mistake of comparing wind and solar to other energy sources rather than to each other.

\* (d) An electrically powered vehicle must be connected to an electricity supply to recharge its batteries.

Evaluate solar cells compared with wind turbines as means of generating electricity.

One advantage of solar cells is that the sun always comes up so the solar cells should be able to provide energy ~~through~~ every day for a set period of time (unless there is cloud cover) whereas ~~via~~ the wind is more temperamental because it could be blowing or not blowing at any time which makes wind turbines more unreliable than solar cells. (6) 5

Also solar cells can be made for personal use for one individual or household, whereas wind turbines provide energy for energy companies which then sell on this energy, as well as the fact that solar cells can be installed in less obvious places, e.g. the roof of a house, whereas wind turbines have to be placed in open fields where everyone can see them which causes visual pollution.



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Examiner Comments

This candidate achieved all six available marks by identifying that solar radiation is variable (cloud cover), wind can blow or not blow, solar cells can be small (for personal use), solar cells can go virtually anywhere (roof of a house), wind turbines require large areas of land (open fields) and visual pollution. Few responses achieved all six marks, but most achieved half marks or more.



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Examiner Tip

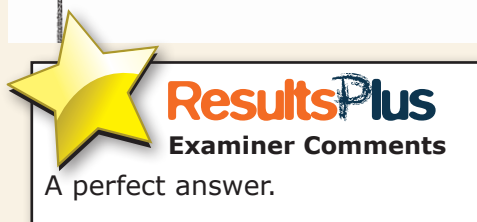
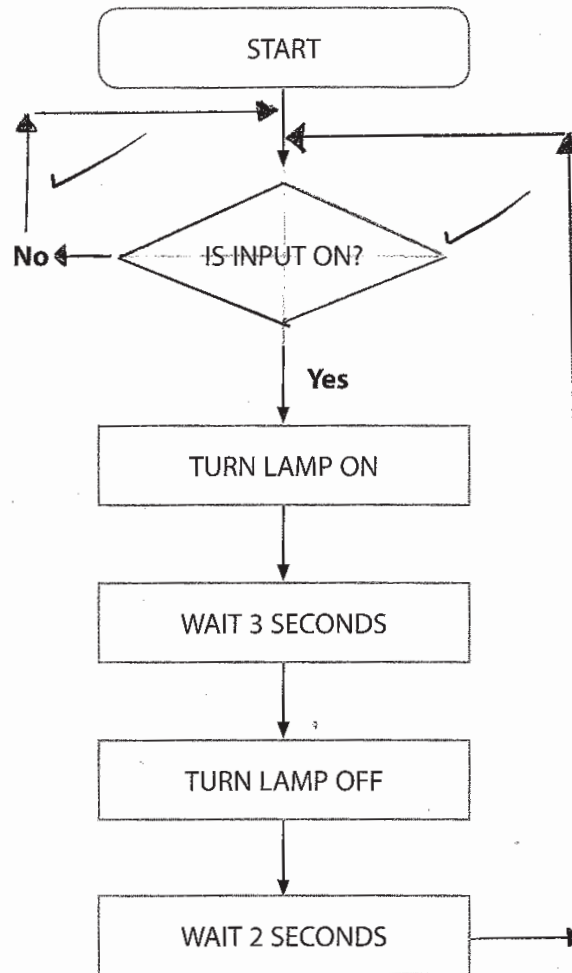
Spend a minute or two planning your response by listing your key points – this will avoid repeating yourself later on.

Q14(a) Most candidates drew the diamond around the 'Is Input on?' Question and the return arrows up from the left of the diamond. Fewer candidates understood the requirement for the feedback loop from the bottom of the flowchart back to (or above) the diamond, (many responses incorrectly returned to the 'Turn lamp on' operator box).

14 The flowchart below is a PIC program which will make a lamp flash continuously when the 'input' signal is on.

(a) Complete the flowchart by adding the correct shape symbol and feedback to make the lamp flash continuously.

(3) 3



Q14(b)i Most candidates could explain that PICs are programmable, but other responses were less common.

(b) (i) Give **two** reasons why a manufacturer may prefer to use a PIC rather than a 555 timer chip in this application.

(2) 2

1 A pic can be reprogrammed and be modified.

2 A pic can have more inputs and outputs than a 555 timer.



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Examiner Comments

A model answer.

Q14(b)ii Successful candidates were aware that computers are faster than human operators and are less likely to make errors. Weaker candidates failed to appreciate that staff can use high quality high resolution testing equipment and achieve accurate results without computerised testing.

(ii) The completed lamp flashing circuit will be tested.

Explain why computerised testing may be preferred to manual testing.

(2)

Computerised quality control testing is always a lot faster than manual fault-finding. This means a lot more circuits will be able to be tested in the given time.

2



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Examiner Comments

By giving two associated points, this response achieves full marks.



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Examiner Tip

For 'explain' questions, make sure the two parts of your answer are linked. Use words like 'so that', 'because', 'which means', 'otherwise', etc



Q14(c) The vast majority of candidates understood built-in obsolescence, and its impact on consumer confidence and purchasing decisions. The better responses were clear and structured, considering the issue from manufacturing, consumer and environmental angles. Weaker responses tended to be repetitive. Most candidates achieved high QWC marks here.

\*(c) The manufacturer decides to make the flashing lamp as cheaply as possible, even though this means that it will not last very long.

Discuss the possible consequences of 'built-in obsolescence'.

(6) 4

Initially, the consumers will be attracted to the product because of the low price, causing a short term increase in market share. This will also increase a firm's revenue and in turn, the profit. Because of low cost manufacturing, if production costs are low so profit margin is further increased. The obsolescence will also mean that consumers would have to keep purchasing the goods because it breaks quickly. This may, however, have a negative effect on buyers who will switch to alternate, more reliable goods, thus decreasing the firm's market share overall. Also, because demand would be very elastic, the fall in demand leads to a fall in profits. Another problem with low-cost manufacturing is it is usually continuous so in case of a problem, all products need to be recalled. Therefore, it is not beneficial to produce the lamps as cheap as possible.



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Examiner Comments

By discussing low price, increased profit, increased market share (sales), keep purchasing goods, switching to more reliable goods, this response achieves five of the six available marks. However, the final six lines say nothing relevant and achieve no marks.

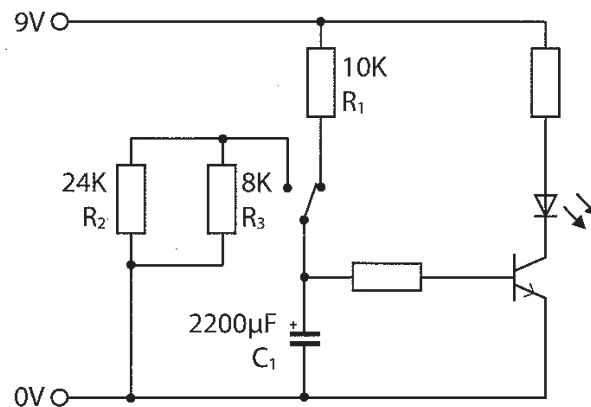


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Examiner Tip

Consider questions from the manufacturer's, the users' and environmental viewpoints.

Q14(d)i Many candidates identified the longer leg as the anode, but many candidates failed to give sufficient detail by stating that the legs are different lengths. Another common error was to talk about the '+' signs on the capacitor, or using meters to identify polarity.

(d) The circuit below is a time delay circuit. When the switch is moved to the position shown, the LED will come on after a short time delay.



(i) Give **two** means of identifying the anode (positive terminal) on a polarised capacitor.

(2) /

- 1 The anode has a longer leg than the cathode. ✓
- 2 the side the anode has a symbol to reconize that side has is the anode. ✗



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Examiner Comments

This typical response correctly states that the anode is longer than the cathode, but incorrectly suggests that the anode is labelled rather than the cathode.

Q14(d)iii More able candidates were able to address each of the components in turn and state their purpose. Weaker responses lacked this clarity and achieved few if any marks. This candidate addresses each component in turn and so achieves full marks.

(iii) Discuss the function of R1, C1 and the transistor in creating the time delay.

(3) 3

The time it takes the capacitor to charge will increase if the values of R1 and/or C1 increase. So the size of R1 and C1 determines the length of the delay. Also transistors let current flow when they are provided with a certain voltage so until the capacitor charges up to that voltage the transistor will not let current flow which creates a time delay of the capacitor charging up to a point where the transistor lets current which means the LED turns

on

(Total for Question 14 = 19 marks)

(9)

## Summary

In summary, there are a small number of issues which centres may wish to aware of;

- Q12 – There must be no repetition across the two different solutions
- Q12 – All responses must have sufficient detail to realise a mark, i.e. which type of switch?
- 'Compare' questions require the candidates to investigate differences rather than similarities.
- CAD, CAM & other used of ICT have drawbacks as well as benefits.
- Candidates should simplistic responses such as 'strong', 'faster', 'quick', 'more efficient', etc.

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