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Examiners' Report
June 2015

GCSE Design and Technology 5EP02 01

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June 2015

Publications Code UG041221

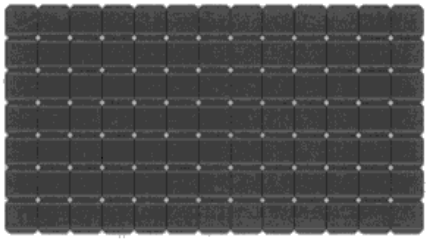
Introduction

This specification has been running for several years, and centres are clearly familiar with its requirements, and candidates are being prepared appropriately. Virtually all candidates are familiar with the structure of the paper, and their responses do present their knowledge and understanding well. It is encouraging to see an increase in the number of centres offering this course.

Question 11 (a) (i)

Most candidates described the use of the PV cell, but a few thought it was a breadboard. It was important that they stated that it converts light energy into electrical energy to achieve the mark.

A model answer



Photovoltaic cell

To convert light energy to electrical energy.

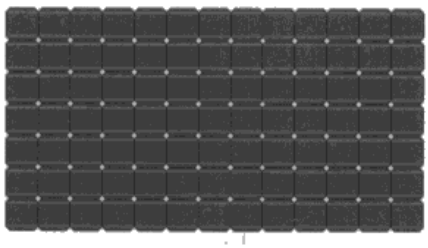
(1)

ResultsPlus
Examiner Comments

This answer is fully accurate.

ResultsPlus
Examiner Tip

Make your responses clear & brief.



Photovoltaic cell

To display any photo or words on the cell

(1)

ResultsPlus
Examiner Comments

The candidate appears to have confused the PV cell with some form of display.

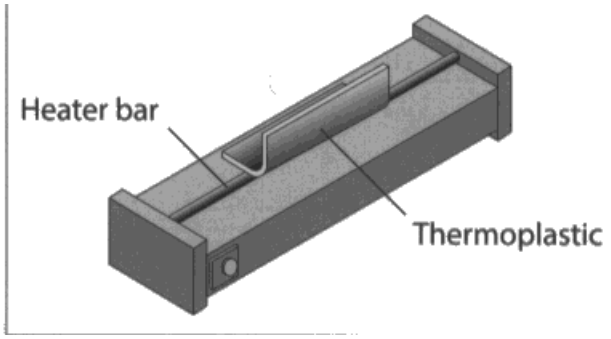
ResultsPlus
Examiner Tip

Look carefully at the words and the images for each question.

Question 11 (a) (ii)

Virtually all candidates identified the purpose of the line bender, but some failed to achieve the mark when they suggested that the plastic/acrylic is melted rather than heated.

No melting takes place, so this response is wrong.



Line bender

Melts your thermoplastic to produse case for your holder.

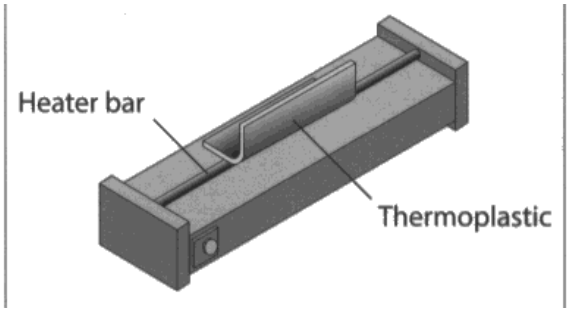
(1)

ResultsPlus
Examiner Comments

The correect term is softening, not melting.

ResultsPlus
Examiner Tip

Use all technical words accurately.



Line bender

To bend Plastics

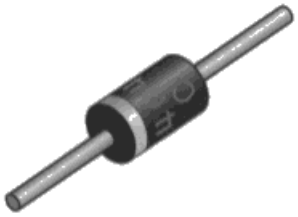
(1)

ResultsPlus
Examiner Comments

A clear and accurate response.

Question 11 (a) (iii)

The vast majority of candidates recognised and correctly named the diode.



diode
Thyristor

(1)

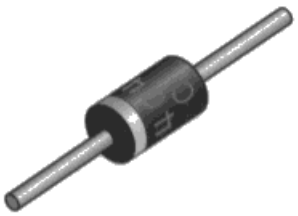
Allows current to flow in one direction only

ResultsPlus
Examiner Comments

Candidates should be familiar with all common components.

ResultsPlus
Examiner Tip

It's always better to guess than to leave the question blank.



Diode

(1)

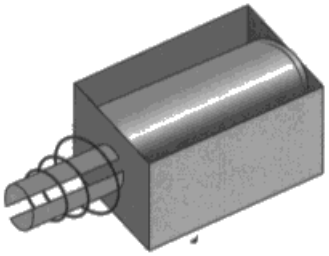
Allows current to flow in one direction only

ResultsPlus
Examiner Comments

A correct response.

Question 11 (a) (iv)

Very few candidates were aware that this was a solenoid, with almost all responses suggesting that it was a motor.



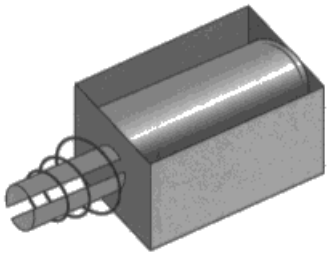
Solenoid

(1)

Converts electric current to straight line movement

ResultsPlus
Examiner Comments

A correct answer.



Thyristor

(1)

Converts electric current to straight line movement

ResultsPlus
Examiner Comments

An incorrect answer, but it was worth guessing rather than giving no response at all.

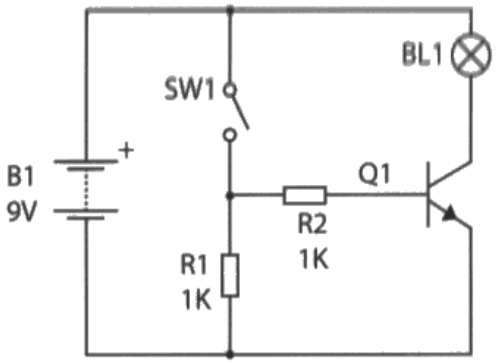
Question 11 (b) (i)

This question discriminated well between candidates of a high and low ability. Roughly half correctly inserted one leg of the resistor in the third row up, while a small fraction inserted the other leg in the fourth row up.

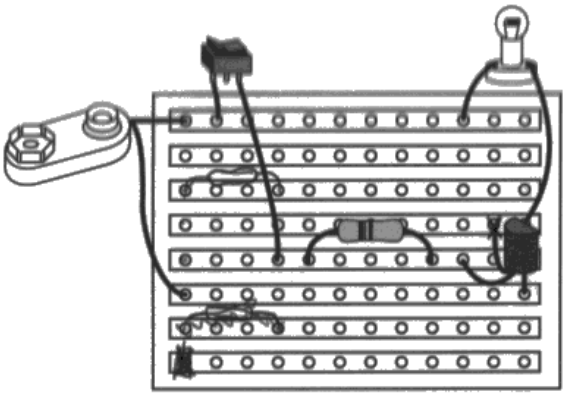
Drawings do not have to be 'works of art', but should be clear.

(b) A student is making a simple electronic circuit.

The drawings below show a circuit diagram and an incomplete stripboard (veroboard) prototype circuit for a lamp.



Circuit diagram



Stripboard circuit

(i) Draw R1 in the correct position on the stripboard circuit.

(2)

ResultsPlus
Examiner Comments

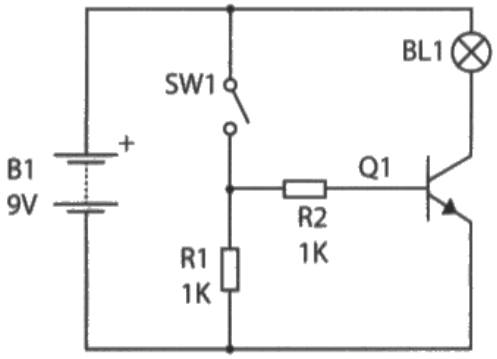
Both terminals of the resistor are incorrectly placed.

ResultsPlus
Examiner Tip

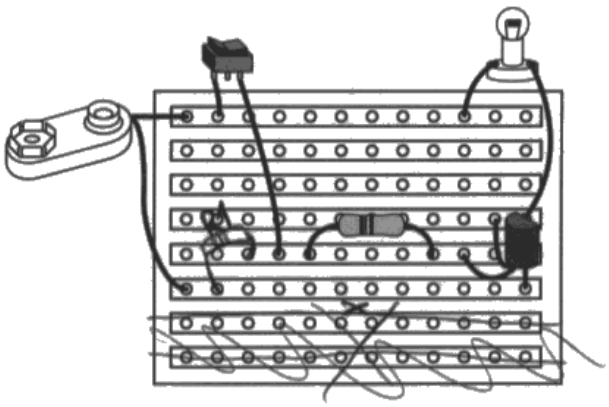
Think carefully - no component would be placed so it doesn't connect to anything else.

(b) A student is making a simple electronic circuit.

The drawings below show a circuit diagram and an incomplete stripboard (veroboard) prototype circuit for a lamp.



Circuit diagram



Stripboard circuit

(i) Draw R1 in the correct position on the stripboard circuit.

(2)

ResultsPlus
Examiner Comments

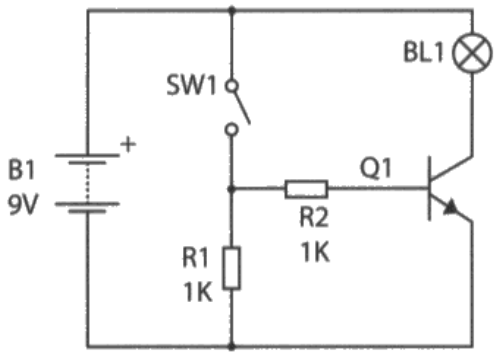
This may be messy, but the candidate's intention is obvious - and correct.

ResultsPlus
Examiner Tip

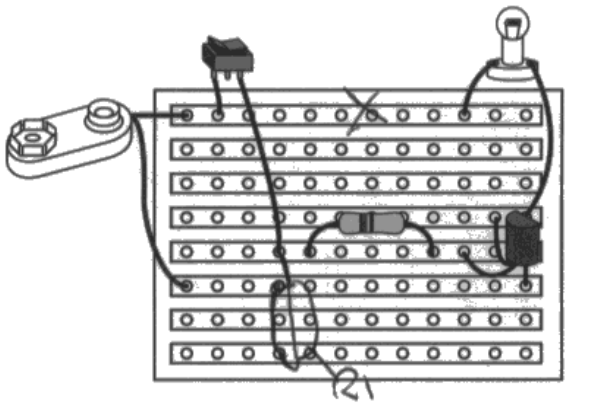
If you want to change your answer, do it clearly.

(b) A student is making a simple electronic circuit.

The drawings below show a circuit diagram and an incomplete stripboard (veroboard) prototype circuit for a lamp.



Circuit diagram



Stripboard circuit

(i) Draw R1 in the correct position on the stripboard circuit.

(2)

ResultsPlus
Examiner Comments

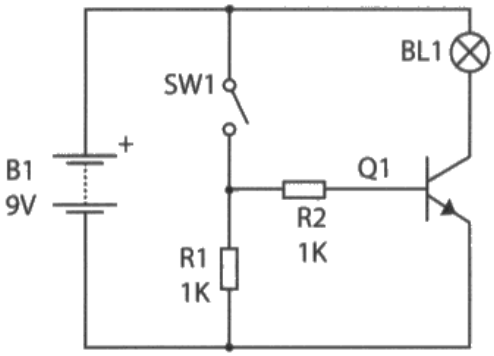
This looks like a guess - but it's got a mark!

Question 11 (b) (ii)

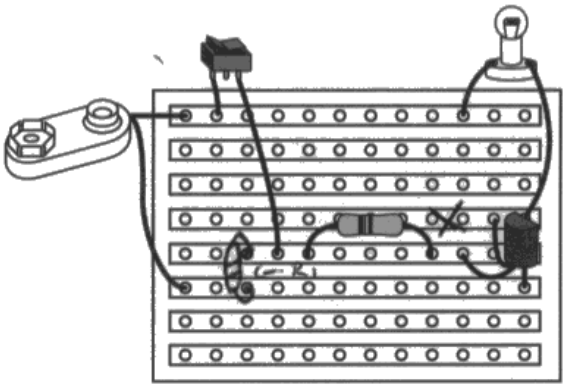
Again, this question discriminated well, with only the most able candidates breaking the track between the legs of the resistor - other responses were randomly placed all around the board. Some cadidates failed to put a cross anywhere which is a shame, as a correct guess would have achieved the mark.

(b) A student is making a simple electronic circuit.

The drawings below show a circuit diagram and an incomplete stripboard (veroboard) prototype circuit for a lamp.



Circuit diagram



Stripboard circuit

(i) Draw R1 in the correct position on the stripboard circuit.

(2)

(ii) Draw an X on the stripboard circuit to show where a track should be broken so the circuit will work correctly.

(1)

ResultsPlus
Examiner Comments

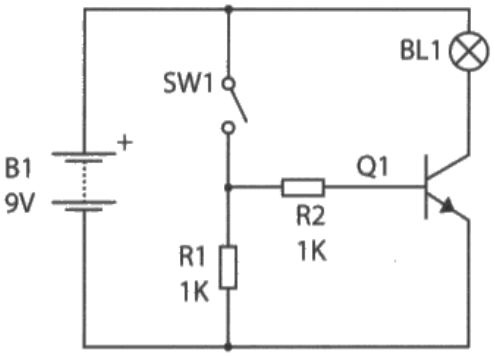
Strip-board is not in common use, but it is in the specification.

ResultsPlus
Examiner Tip

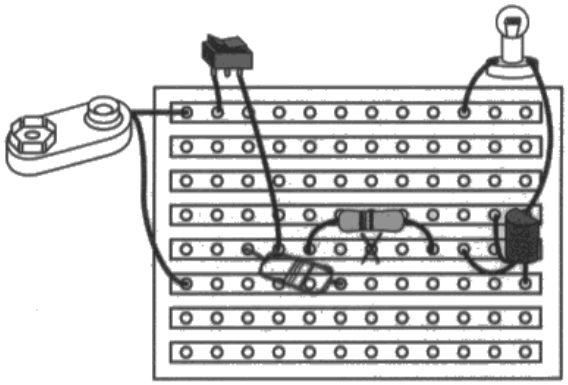
This was wrong, but still worth a guess.

(b) A student is making a simple electronic circuit.

The drawings below show a circuit diagram and an incomplete stripboard (veroboard) prototype circuit for a lamp.



Circuit diagram



Stripboard circuit

(i) Draw R1 in the correct position on the stripboard circuit.

(2)

(ii) Draw an X on the stripboard circuit to show where a track should be broken so the circuit will work correctly.

(1)

ResultsPlus
Examiner Comments

Not many candidates got this correct, but this response is perfect.

Question 11 (b) (iii)

Candidates must remember that the responses; 'cheaper', 'faster' & 'more accurate' are rarely sufficiently detailed to achieve credit. The mark scheme gives a wide range of responses that are correct.

(iii) Give **one** advantage of using PCB design software rather than drawing circuits by hand.

(1)

You can make less errors in the drawing so it would be more accurate on the computer

ResultsPlus
Examiner Comments

One mark for 'fewer errors', even though this candidate has not shown a strong understanding of the topic.

(iii) Give **one** advantage of using PCB design software rather than drawing circuits by hand.

(1)

Using a pcb design software is more accurate then by doing drawing it by hand.

ResultsPlus
Examiner Comments

The candidate has rephrased the question, which gets no credit.

ResultsPlus
Examiner Tip

You won't get any marks for rewording the question.

Question 11 (c) (i)

Many candidates compared breadboard to Printed Circuit Boards (PCBs), which denied them the mark. Correct responses tended to discuss the lack of PCB preparation time.

(c) (i) Give **one** advantage of using stripboard instead of printed circuit board to construct this circuit.

(1)

You can reuse it, instead of producing many prototype PCBs.

ResultsPlus
Examiner Comments

The candidate has discussed breadboard rather than stripboard.

ResultsPlus
Examiner Tip

Try not to get similar ideas mixed up.

(c) (i) Give **one** advantage of using stripboard instead of printed circuit board to construct this circuit.

(1)

Don't have to manufacture a PCB board using expensive materials and machinery

ResultsPlus
Examiner Comments

This is an accurate answer. A brief response is all that is needed for one mark.

ResultsPlus
Examiner Tip

Clear and brief answers are usually best.

Question 11 (c) (ii)

This is a very common type of circuit, and it is encouraging to see so many candidates understanding the funtion of each component.

(ii) Describe the function of component R2 in this circuit.

(2)

To provide low current for the transistor. Due to it having a low resistance it is most likely for the current to pass through it towards the transistor.

ResultsPlus
Examiner Comments

The candidate has one mark for 'low current', and one mark for 'transistor'.

ResultsPlus
Examiner Tip

You'll need to say two things to get two marks.

(ii) Describe the function of component R2 in this circuit.

(2)

component R2 is a Resistor and it allows current to flow through the circuit

ResultsPlus
Examiner Comments

This candidate has named the component, but the question asks for its function.

ResultsPlus
Examiner Tip

Read the question carefully.

Question 11 (d)

By deliberately allowing responses in any sequence, and requiring candidates to only recall four of the many stages of the photoetching process, there was a high proportion of good responses for this question.

(d) The printed circuit board will be produced using photo etching.

Give **four** different stages in the photo etching process.

(4)

1 ultraviolet directed unto the circuit board

2 wait for the board to develop

3 Etch the track onto the board

4 where gloves when dealing with chemicals

ResultsPlus
Examiner Comments

The first two points are correct, the third is rephrasing of the question, the last one is a safety point, which was not asked for.

ResultsPlus
Examiner Tip

Read the question carefully. Safety points and production processes can both get you marks, but only if that's what the question has asked for.

(d) The printed circuit board will be produced using photo etching.

4 ferric chloride Wash in cold water

Give **four** different stages in the photo etching process.

(4)

1 Print out the circuit design on a acetate sheet

2 Place the acetate sheet and photo sensitive board in a light box

3 Place the PCB into a etching tank containing ferric chloride for 10 minutes

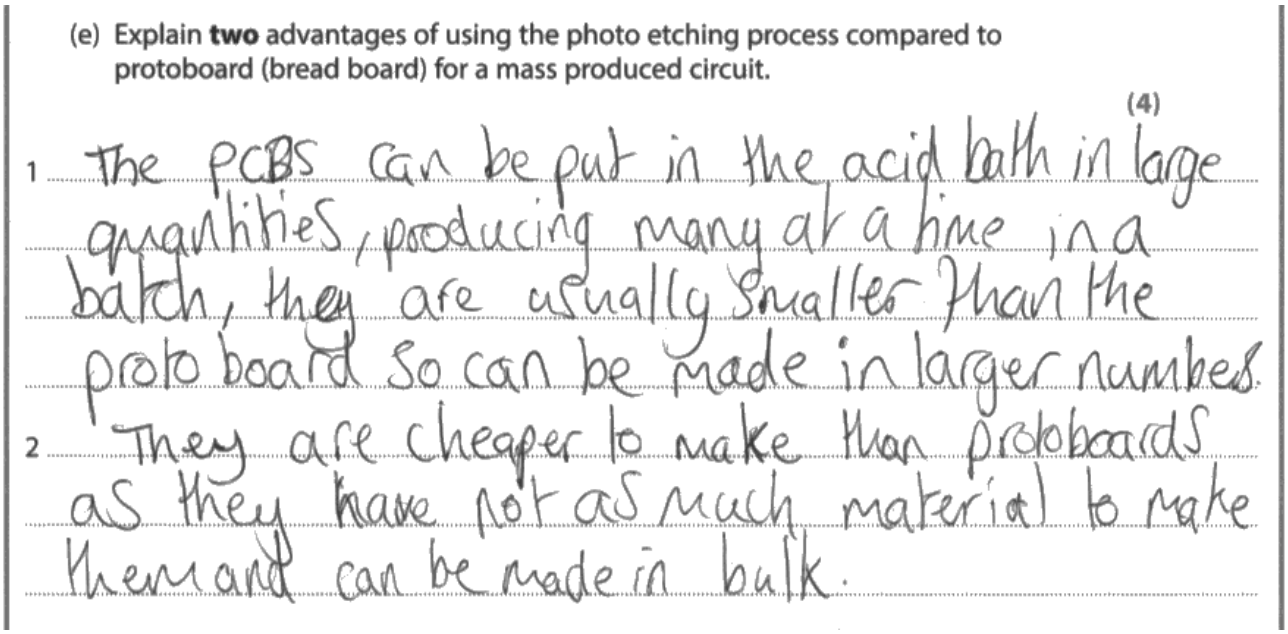
4 Wash in cold water to remove ferric chloride and etching solution

ResultsPlus
Examiner Comments

Four correct responses, four marks achieved.

Question 11 (e)

The majority of candidates knew and could verbalise the advantages of photoetching over breadboard, but weaker candidates often stated rather than explained their responses, thereby failing to achieve the third and fourth mark available.



(e) Explain **two** advantages of using the photo etching process compared to protoboard (bread board) for a mass produced circuit.

(4)

1 The PCBS can be put in the acid bath in large quantities, producing many at a time, in a batch, they are usually smaller than the proto board so can be made in larger numbers.

2 They are cheaper to make than protoboards as they have not as much material to make them and can be made in bulk.

ResultsPlus
Examiner Comments

Two clear, well-explained and accurate responses.

ResultsPlus
Examiner Tip

For 'explain' responses, you may want to write quite a lot to make sure you've given enough information to get both marks.

(e) Explain **two** advantages of using the photo etching process compared to protoboard (bread board) for a mass produced circuit.

(4)

1 For a mass produced circuit, ~~or~~ using the photo etching process allows for a easier and faster way of production because you just have to design the circuit once, while you can produce the circuit and print it many times.

2 Photo etching also allows for a more accurate production of specific circuits, which can boost sales for different circuits, while a person can make many different circuits on a bread board.

ResultsPlus
Examiner Comments

The second 'advantage' talks about accuracy, which rarely achieves a mark on its own, and then goes on to give an advantage of breadboard!

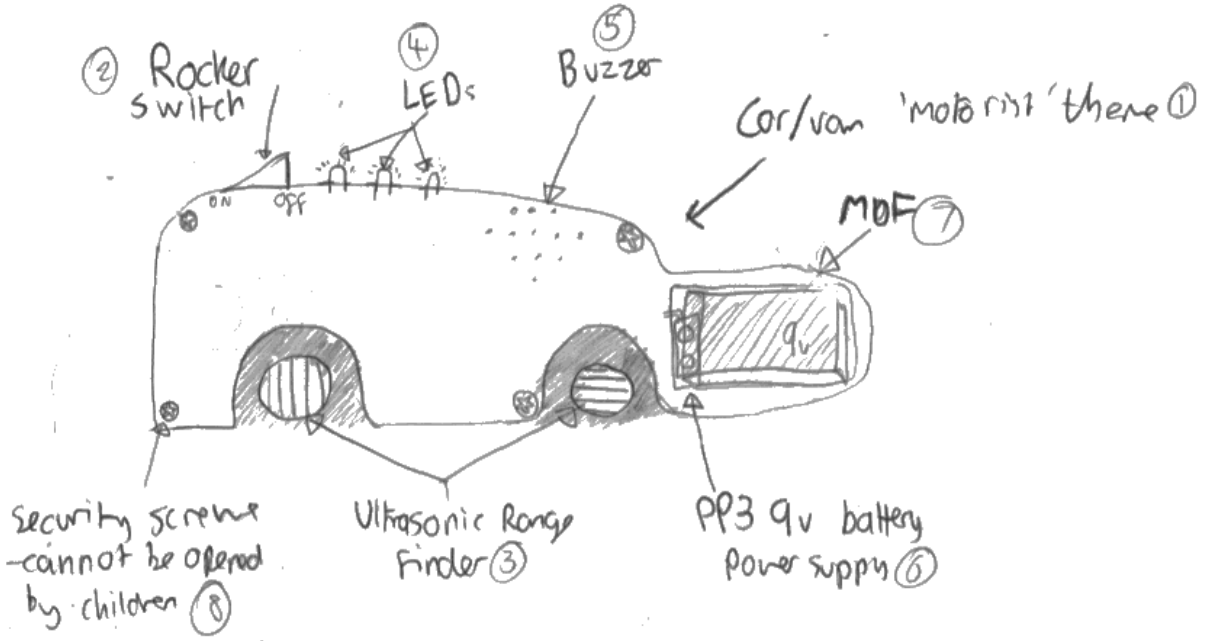
ResultsPlus
Examiner Tip

'Give two advantages' is not the same as 'compare'.

Question 12

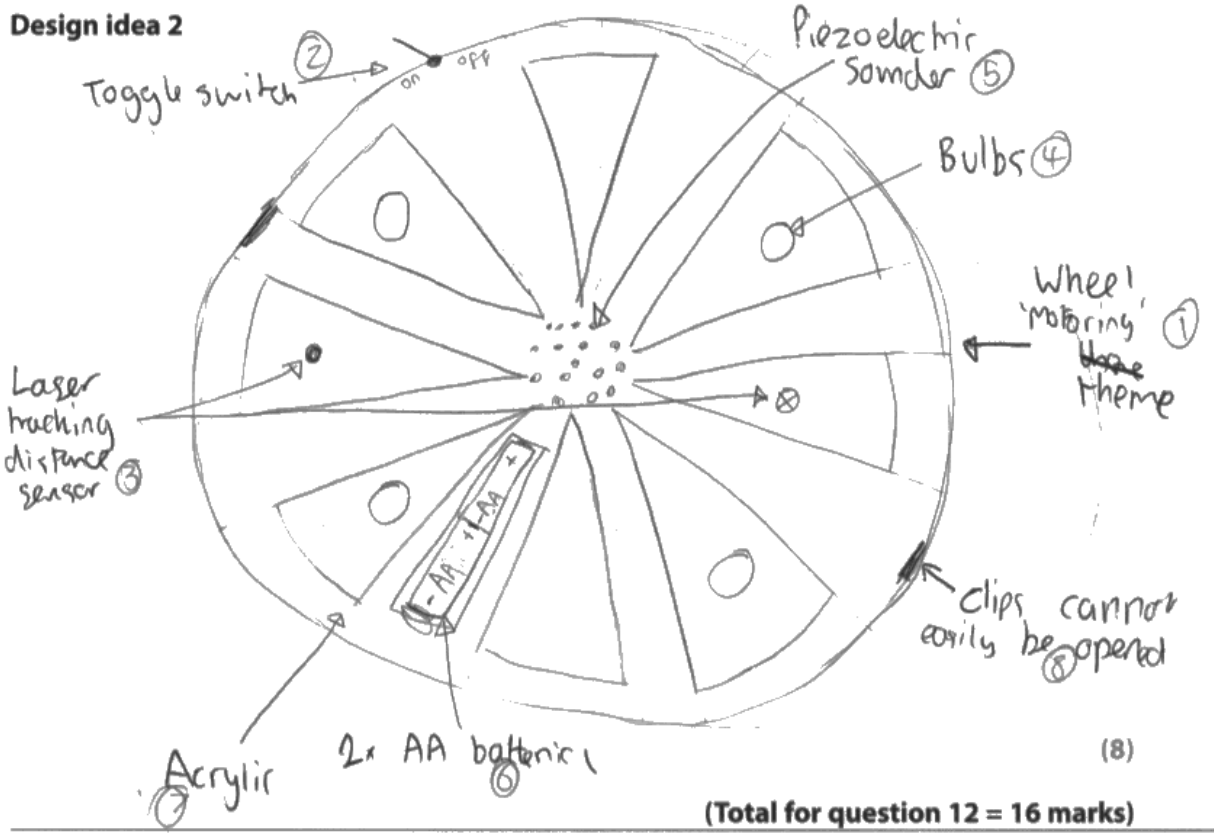
Centres are now familiar with the format of this question, and it is encouraging to see even the weakest candidates producing good responses. As in previous years, candidates tend to underachieve when they repeat responses for both design solutions, e.g. two Light-emitting Diodes (LEDs) or two buzzers. Adhesives are not suitable for sealing electronic circuits, so this response failed to achieve a mark.

Design idea 1



(8)

Design idea 2



(8)

(Total for question 12 = 16 marks)

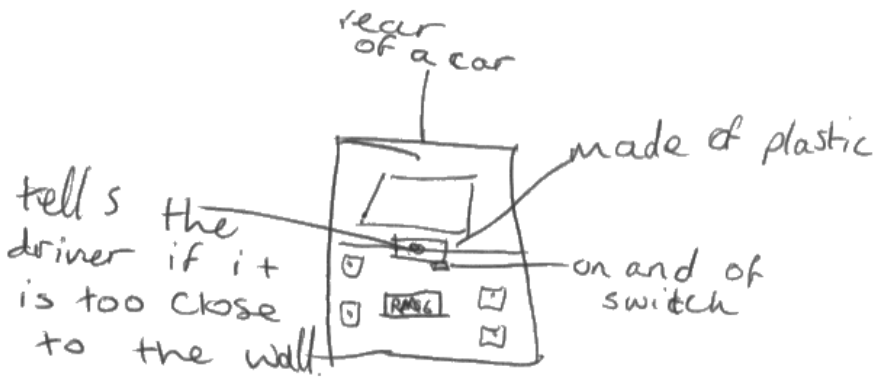
ResultsPlus
Examiner Comments

The candidates has clearly numbered how each of the specification points are addressed, they are detailed and accurate.

ResultsPlus
Examiner Tip

Lay your eight points out clearly so there's no confusion about your answers.

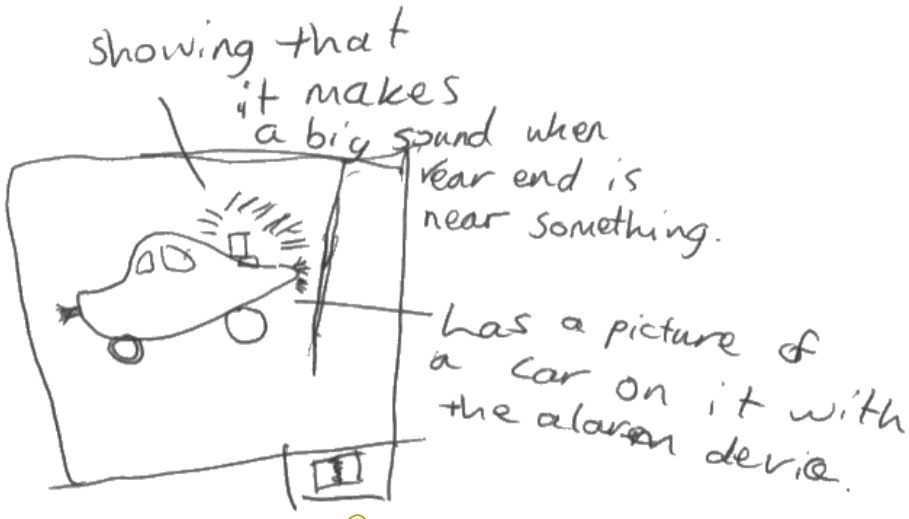
Design idea 1



Makes an alarm sound when you go further towards the wall.

(8)

Design idea 2



ResultsPlus
Examiner Comments

The 'back of a car' and 'picture of a car' have achieved two marks, but there is no other sawardable material, (on/off switch does not achieve any credit).

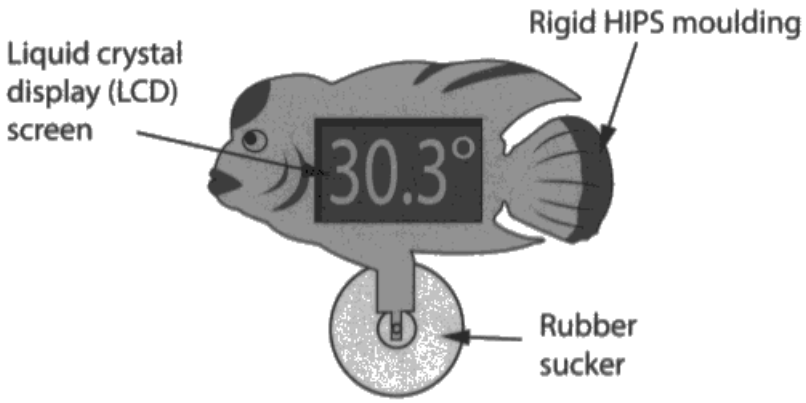
ResultsPlus
Examiner Tip

You teacher will have told you how much detail you need to include in question 12. Remember, you have to show that you know more about electronics than someone who hasn't studied it for two years.

Question 13 (a) (i)

This question attracted good responses; the size and clarity of the display ensure that it is easily read. Obviously, merely rephrasing the question does not achieve a mark.

13 The picture below shows a thermometer designed to go inside a fish tank.



(a) Describe how the thermometer is successful in meeting the following specification points.

(i) It is easy to read the temperature.

(2)

The numbers are bright and large. ~~as~~ This makes it easy to read the temperature.

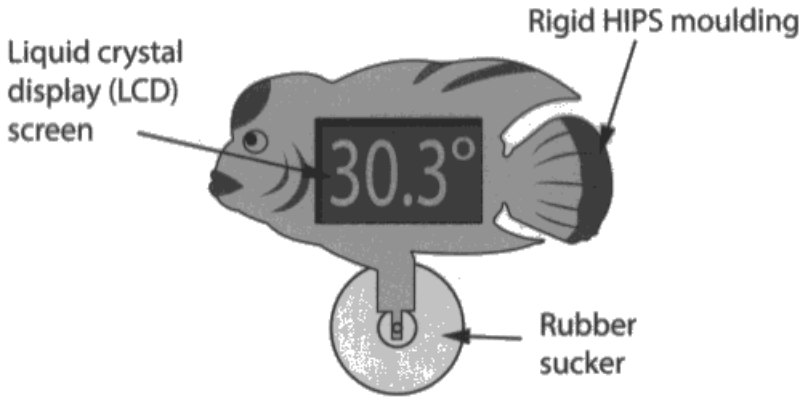
ResultsPlus
Examiner Comments

One mark for recognising that the display is 'large'.

ResultsPlus
Examiner Tip

For these qestions, identifiing the correct features of the diagram will get marks, but rephrasing the question doesn't.

13 The picture below shows a thermometer designed to go inside a fish tank.



(a) Describe how the thermometer is successful in meeting the following specification points.

(i) It is easy to read the temperature.

(2)

It has a big screen, meaning it is easier to see and view the temperature. It also has an LCD screen, which gives a sharp and clear image also making it easier to see

ResultsPlus
Examiner Comments

Identifying the screen as 'large' and 'LCD' has achieved both marks for the candidate.

Question 13 (a) (ii)

Candidates found this question more challenging, almost all identified the sucker as the relevent feature, but few mentioned its size, or its ability to stick to glass.

(ii) It can be securely fixed to the fish tank. (2)

It has a rubber sucker which will work well, no tools needed to fix it on and with the pressure of the water, should stick on strongly and for a long time.

ResultsPlus
Examiner Comments

One mark for 'sucker', one mark for 'glass'.

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Examiner Tip

Think about how the product will be used.

(ii) It can be securely fixed to the fish tank. (2)

Because of the HIPS moulding

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Examiner Comments

No part of this answer is worth a mark.

Question 13 (b)

Most responses referred to the small size and long life of watch batteries, as well as their availability, although weaker candidates failed to explain why these features were relevent for this particular situation.

(b) Explain **two** advantages of using watch batteries for the thermometer.

(4)

1 There are very compact and small so it can fit in the product easily because the product is small too It saves materials rather than using normal batteries as the product would have to be made bigger

2 Watch batteries are very long lasting so they would not have to be changed over and over again ~~It~~ They saves ~~cost~~ the cost in buying the batteries

ResultsPlus
Examiner Comments

Two clear, accurate and well justified responses have achieved all four marks.

ResultsPlus
Examiner Tip

'Explain' questions need a two-part answer. Use connectives, such as; like, as, because, or else, otherwise, so that .....

(b) Explain **two** advantages of using watch batteries for the thermometer.

(4)

1 Reduces size of packaging - using watch batteries allows the circuit packaging to be smaller which is cost effective

2 The watch battery in this case has only one function which is to display the temperature, the battery will have a longer life.

ResultsPlus
Examiner Comments

The candidate achieves marks for 'smaller packaging' and 'longer life', but hasn't given good reasons why these are advantages.

ResultsPlus
Examiner Tip

Give suitable reasons when required.

Question 13 (c)

Again, candidates invariably mentioned recycling, but few gave a reason why recycling is important.

(c) The thermometer is designed so it can be taken apart when it is no longer needed.

Explain why it is important to be able to disassemble products at the end of their lives.

(2)

So the components and materials can be reused as well as recyded to make new products.

ResultsPlus
Examiner Comments

The environment and green issues will always crop up in Technology exams.

ResultsPlus
Examiner Tip

Again, a two-part answer using a connective ('as well as') has achieved full marks.

(c) The thermometer is designed so it can be taken apart when it is no longer needed.

Explain why it is important to be able to disassemble products at the end of their lives.

(2)

So you can reuse it again without it getting damaged. Also so you can save space on not having to keep it in one peice piece or breaking it easily if it wasn't disassembled.

ResultsPlus
Examiner Comments

The candidate has given three responses, but none of then are specific enough to achieve a mark.

ResultsPlus
Examiner Tip

Give short, clear responses.

Question 13 (d)

Candidates seem to view LEDs as low cost, energy efficient products, and Liquid-crystal display (LCD) as exotic, expensive and power-hungry, which is incorrect. As a consequence, many of the responses to this question were factually incorrect. Where the responses were accurate, candidates usually discussed brightness, power consumption, ease of repair, viewing angle and so on, thereby achieving good marks.

This type of question comes up regularly on this paper, but does require the candidate to have a good knowledge of two components.

*(d) Evaluate liquid crystal displays (LCDs) and LED dot matrix displays, in terms of user requirements and performance requirements, for use in the thermometer.

(6)

It would have to be easily visible (temperature) this is best suited to an LCD display as its clearer to see and you can probably change the font. However the Led dot matrix would be alot brighter as they are led's which are better in todays market (e.g led Tv is better than LCD TV). Also LED's have a longer lyespan the LCD's as they are more efficient in the way the works. The LCD would use alot more power to illuminate the whole Screen whereas an LED would only use power to light up the actual temperatere. Leds were designed to be efficient by being bright but still energy saving the LCD is opposite because its not energy Saving as it uses to much power. If they decide to use watch batteries to power the thermometer device then they should use the LED Dot matrix as it doesnt take alot of power to light them however on LCD screens alot more power is needed because the whole Screen has to be lit which means more power.

ResultsPlus
Examiner Comments

This candidate has written a great deal, but has certainly given sufficient points to achieve all four available marks.

ResultsPlus
Examiner Tip

If you've got time, writing more points could well get you more marks.

*(d) Evaluate liquid crystal displays (LCDs) and LED dot matrix displays, in terms of user requirements and performance requirements, for use in the thermometer.

(6)

Bothe LCD and LED display can show the temperature for the thermometer. LCD display has a higher resolution than LED which means it ~~gives~~ the information displayed looks better. LCD displays are more expensive than LED displays which means that the thermometer will cost more. LED display can also be used, LED display take less power to run which means the batteries don't have to be charged very often. LED display also have a a longer life meaning they don't need to be replaced as often as LCD displays. LED display is overall better as it is more environmentally friendly as will last much longer.

ResultsPlus
Examiner Comments

The candidate has made several errors, but still given enough accurate information to achieve four of the six available marks.

Question 14 (a) (i)

Almost all candidates could define internet marketing as something along the lines of 'advertising and selling on the internet'.

14 (a) A company wishes to manufacture and sell an automatic greenhouse watering system. It is considering using internet marketing.

(i) State the meaning of the term 'internet marketing'.

(1)

When you advertise online.

ResultsPlus
Examiner Comments

Virtually all candidates understood internet marketing, but could explain it to varying degrees.

ResultsPlus
Examiner Tip

For one mark questions, a short, clear answer may well be all you need to give.

Question 14 (a) (ii)

Candidates tended to explain that the global reach of the internet would give them more potential customers. However, many said that this would give them problems with distribution, which is an unrealistic objection. Better responses were usually focussed on gardeners often being older people who tend to use the internet less than other demographics.

(ii) Explain **one** advantage and **one** disadvantage of internet marketing for the company.

(4)

Advantage Lots of people use the internet daily and so a lot of people would see the advert, the internet is constantly gaining users and so it's an expanding consumer base

Disadvantage People who have a greenhouse and do gardening are commonly retired or OAPs and so would be less likely to see the internet marketing

ResultsPlus
Examiner Comments

Most candidates discussed the global reach of the internet. Fewer mentioned a suitable disadvantage, but this is a good example.

ResultsPlus
Examiner Tip

Read the question, and make sure your answer talks about the situation you have been asked about.

(ii) Explain **one** advantage and **one** disadvantage of internet marketing for the company.

(4)

Advantage the website is up 24/7 your can sell globally

Disadvantage a lot of people are scared to use the internet for shopping

ResultsPlus
Examiner Comments

The candidate has given two advantages, but not explained either of them. Few people are scared of interent shopping, so it would require further explanation for a mark.

ResultsPlus
Examiner Tip

'Explain' means give a point with a reason, not give two points, (don't forget your connectives)!

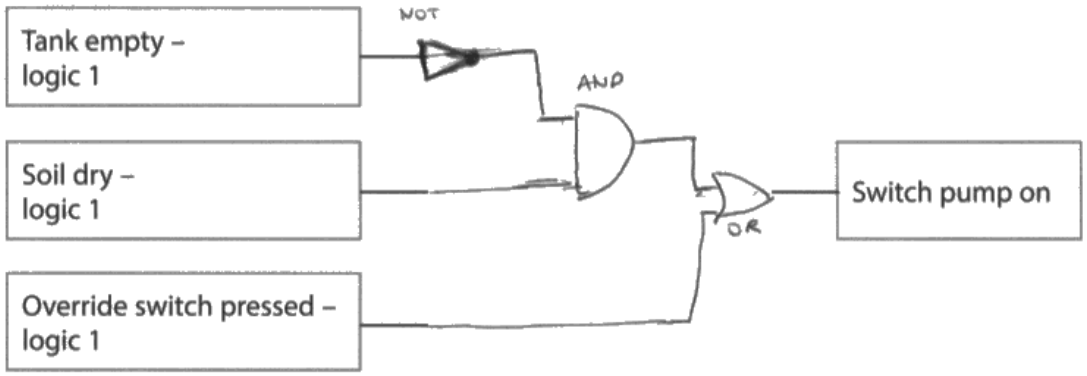
Question 14 (b)

Interestingly, roughly half of the candidates failed to recall the correct symbols for logic gates, but the vast majority of those who did correctly connected them to give the desired output.

The automatic greenhouse watering system will switch on a pump when the soil is dry and the water tank contains water, or when an 'override' switch is pressed.

(b) Add **three** logic gate symbols to the block diagram below to make the automatic greenhouse watering system work correctly.

(4)



ResultsPlus
Examiner Comments

It was pleasing to see how many candidates could remember the three logic gate shapes.

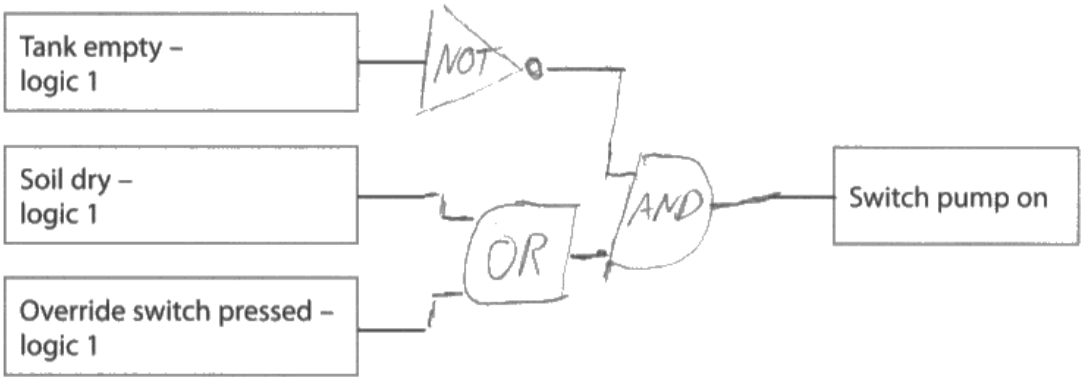
ResultsPlus
Examiner Tip

With logic gates, the words in the questions always tell you what gates to use!

The automatic greenhouse watering system will switch on a pump when the soil is dry and the water tank contains water, or when an 'override' switch is pressed.

(b) Add **three** logic gate symbols to the block diagram below to make the automatic greenhouse watering system work correctly.

(4)



ResultsPlus
Examiner Comments

An incorrect response, but it did achieve two of the four available marks.

ResultsPlus
Examiner Tip

Always guess if you're not sure of the correct answer.

Question 14 (c) (i)

A small proportion of responses achieved a mark by using the word 'monostable', but otherwise this question attracted very few correct responses.

(c) (i) Describe how a 555 timer circuit could be used to allow the pump to operate for a fixed period of time.

(2)

The 555 Circuit Latches which means it turn doesn't turn off until the circuit is broken.

ResultsPlus
Examiner Comments

No awardable material.

ResultsPlus
Examiner Tip

The candidate has had a guess, which is the right thing to do if you don't know the answer.

Question 14 (c) (ii)

Conversely, most candidates did correctly identify the resistor and capacitor as the two required components.

(ii) State which **two** components could control how long the 555 timer circuit would keep the pump on for.

(2)

Component 1 Capacitor

Component 2 Resistor.

ResultsPlus
Examiner Comments

Two correct responses.

ResultsPlus
Examiner Tip

Sometimes you you only need one word for each mark - as long as it's the right word!

Question 14 (d)

Although this was the most challenging question on the paper, is was pleasing to see candidates across the ability spectrum able to achieve some marks from the six available. Most candidates were aware that the logic gate's functions are fixed while those of the PIC can be altered, and that this required the PIC user to have time, skills and equipment. Otherwise, more able candidates achieved more marks as one would expect.

*(d) Compare the use of logic gates with PICs in control circuits.

(6)

logic gates are more simple to use and its easy to use them. However PICs are more diffuult to understand how they work and function. logic gates are alot cheaper to use in a circuit because pics are alot more expensive. Pics are more complex devices which means you can do more things on them, whereas on a logic gate you are limited to what it can do. Pics are for people that are more advanced in electronics as you have to take into Consideration how the pic has been programmed, whereas on the logic gates the come pre-set so you dont have to Waste time organising and programming them. logic gates are great to use if you are making a simple Circuit e.g a flashing led circuit however if you are making something complex such as an alarm then its more efficient to use a Pic's.

ResultsPlus
Examiner Comments

The candidate has made several points and given reasons for each point.

ResultsPlus
Examiner Tip

The key word in this question is 'compare'. This is a clear & well-argued response that has achieved full marks.

*(d) Compare the use of logic gates with PICs in control circuits.

(6)

a pic controller can be programmed to the need of your specific circuit and its use however with logic gates you do not have that. with logic gates you have to choose the correct gate so that your circuit will run smoothly.

ResultsPlus
Examiner Comments

This candidate has done very well to achieve four marks in just over five lines!

ResultsPlus
Examiner Tip

If you have time, you should be writing a lot more than this for the 6-mark questions. Not many candidates can get four marks for so little writing.

Paper Summary

Based on their performance in this paoer, the candidates are encouraged to:

1) Try to avoid justifying processes by only suggesting that they are easier, faster or cheaper. These answers are unlikely to give you a mark.

2) Be careful not to confuse similar components, e.g. breadboard/stripboard, transistors/ thyristors.

3) Try to remember that for two marks you will need a two-part response. Use connectives, such as 'with', 'because', 'or else', 'otherwise'.....

4) Question 12 requires you to demonstrate that you know more about electronics than someone who has not studied it for two years, so 'switch', 'light', 'battery' will not achieve any marks, whereas 'rocker switch', 'AAA battery' and 'red LED' will achieve marks.

5) Again, in question 12, be careful not to repeat any of your answers, e.g. 'red LED' and 'flashing LED' are both LEDs.

6) Quite a few candidates suggested gluing the package closed as a means of securely sealing it. This is not suitable for an electronic product that may require servicing, so don't suggest techniques that are not suitable, (although it is always better to guess than to not give an answer at all).

7) For question 13d, many candidates thought that LEDs are cheaper than LCDs and use less power. If that was the case, your watch, phone, etc., would use LEDs. Try to use your everyday knowledge to help you where possible.

8) Question 14 is always the most challenging one on the paper, so don't worry if you can't answer it as well as you would like. However, there are six marks available, so try to give at least six points if you can.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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