

Commentary on candidate evidence

Assessors awarded the candidate evidence the following marks for each question of the question paper.

Candidate 1

Question 1(a)

The candidate was awarded **3 marks**. They correctly identified the resistor, correctly drew the ammeter symbol and correctly described the function of the light dependent resistor as changing resistance with a change to light intensity.

Question 1(b)(i)

The candidate was awarded **1 mark**. They correctly determined the resistance of the resistor. The answer included the correct unit symbol.

Question 1(b)(ii)

The candidate was awarded **1 mark**. They correctly determined the value of the percentage tolerance, including the correct use of the $\pm$ symbol.

Question 1(b)(iii)

The candidate was awarded **2 marks**. They correctly determined the maximum value and minimum value of the resistance of the resistor.

Question 1(c)

The candidate was awarded **0 marks** as their response stated an incorrect value.

Question 2

The candidate was awarded **2 marks**. They correctly identified two valid responses, stating that eye protection should be worn and that protection from fumes is required by opening windows, which implies good ventilation. 'Protection from fumes' on its own would have been insufficient as it does not show what action the candidate has taken to reduce risk to health.

Question 3(a)(i)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 3(a)(ii)

The candidate was awarded **3 marks**. They correctly stated the Ohm's Law relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 3(a)(iii)

The candidate was awarded **3 marks**. They correctly stated an appropriate power relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 3(b)(i)

The candidate was awarded **3 marks**. They correctly stated an appropriate relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 3(b)(ii)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 4(a)(i)

The candidate was awarded **0 marks**. They did not correctly identify the integrated circuit as stated in the data sheet. The name of the individual gate 'NOR' on its own is not an acceptable response.

Question 4(a)(ii)

The candidate was awarded **1 mark** as they correctly identified an acceptable output pin.

Question 4(a)(iii)

The candidate was awarded **1 mark** as they correctly identified the logic state as logic 1.

Question 4(b)

The candidate was awarded **4 marks**. They correctly completed each column of the truth table and was awarded full marks.

Question 5(a)

The candidate was awarded **1 mark**. The candidate's response was acceptable indicating that colour coding is used to identify part(s) of a circuit that have the same potential/voltage/signal.

Question 5(b)(i)

The candidate was awarded **1 mark**. They correctly identified wire 3 as the wire that should have blue insulation. Candidates should be familiar with standard wire colour conventions used throughout the course; red is used for positive supply (+V), black for the 0 V (ground) connection. Understanding these conventions helps candidates interpret stripboard layout diagrams.

Question 5(b)(ii)

The candidate was awarded **1 mark** as their response was acceptable.

Question 5(b)(iii)

The candidate was awarded **1 mark**. They correctly stated that one probe should be connected to the negative side of the LED gaining 1 mark. The candidate incorrectly stated that the other probe should be connected to the positive side of the LED. They do not describe what position the dial should be set/turned to so cannot access the third mark. The expected response was for candidates to identify which test points should be used however, alternative responses were accepted when appropriately described.

Question 6

The candidate was awarded **3 marks**. They correctly identified that the LED is incorrectly orientated. The use of 'upside down' was acceptable. The candidate correctly identified that the supply voltage was too low. The candidate labelled the resistors as 'R₁', 'R₂' and 'R₃' on the diagram and correctly identified that the resistor in series with the LED, resistor 3, was too large a value of resistance.

Question 7(a)

The candidate was awarded **3 marks**. They correctly stated the potential divider relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 7(b)

The candidate was awarded **0 marks**. They incorrectly stated that as temperature increases, the resistance of the thermistor increases, and so does the voltage, so they could not access the first mark. The candidate does not state clearly that the voltage across the variable resistor has increased, so cannot access the second mark. The use of the switch over value of 1.8V was ignored. Describing the MOSFET allowing current to flow would be acceptable for the achieving the third mark, but the candidate then continues by incorrectly stating that this causes the buzzer to go off, so cannot achieve the third mark.

Question 7(c)

The candidate was awarded **0 marks**. The candidate's response was not acceptable as it did not state that it allows the user to control the temperature at which the circuit activates.

Question 8

The candidate was awarded **5 marks**. They correctly completed all rows of the costings sheet.

Question 9

The candidate was awarded **4 marks**. The candidate's response was an acceptable attempt at a block/system diagram, not simply a list or table of components. The block diagram was created using a ruler and straight lines which is best practice. The candidate correctly labelled the three subsections of the block diagram, including the dashed lines to separate each subsection. They correctly selected the two input devices and correctly selected the two output devices. The candidate correctly selected the two required gates to meet the specification. They have not correctly linked the input devices to the gates and have not correctly linked the gates to the output devices.

Question 10

The candidate was awarded **4 marks**. The candidate's response was an acceptable attempt at a layout diagram using the additional pre-printed template and using appropriate component footprints. The layout diagram was created using a ruler and straight lines, where appropriate, which is best practice. The candidate accessed the first mark by labelling all components shown using the appropriate component labels provided. The candidate correctly placed an 'X' to indicate a cut track underneath component R_2 , accessing the second mark. The candidate accessed the third mark for correctly showing SW_1 , with solder points, connected across C_1 and connected to 0 V with appropriate links, breaks and connected to R_2 . The candidate accessed the fourth mark for correctly showing the branch containing R_1 and C_1 with appropriate links and breaks. The candidate did not access the fifth mark as the link between the emitter of TR_1 to 0 V was missing.

Candidate 2

Question 1(a)

The candidate was awarded **3 marks**. They correctly identified the resistor, correctly drew the ammeter symbol and correctly described the function of the light dependent resistor as changing resistance with a change to light intensity.

Question 1(b)(i)

The candidate was awarded **1 mark**. They correctly determined the resistance of the resistor. The answer included the correct unit symbol.

Question 1(b)(ii)

The candidate was awarded **1 mark**. They correctly determined the value of the percentage tolerance, including the correct use of the $\pm$ symbol.

Question 1(b)(iii)

The candidate was awarded **2 marks**. They correctly determined the maximum value and minimum value of the resistance of the resistor.

Question 1(c)

The candidate was awarded **0 marks** as their response stated an incorrect value.

Question 2

The candidate was awarded **2 marks**. They correctly identified two valid responses. Stating that protection from fumes is required by opening windows, which implies good ventilation, was sufficient for the first mark. The second statement regarding holding the stripboard correctly so it does not fall over, is insufficient to gain a mark as the candidate's response does not state the use of a 'helping hands' device. The third statement regarding the wearing of gloves with the purpose to prevent burns to hands explained was sufficient. Stating 'wear gloves' on its own would have been insufficient as it does not show what risk to health the candidate has tried to reduce. Also, wearing gloves could increase risk whilst soldering.

Question 3(a)(i)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 3(a)(ii)

The candidate was awarded **3 marks**. They correctly stated the Ohm's Law relationship, substituted the values correctly and stated the correct final answer with correct unit symbol.

Question 3(a)(iii)

The candidate was awarded **3 marks**. They correctly stated an appropriate power relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 3(b)(i)

The candidate was awarded **3 marks**. They correctly stated an appropriate relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol. The final step of equalling $1/0.25$ to 4Ω was imprecise working but accepted in line with the additional marking guidance.

Question 3(b)(ii)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 4(a)(i)

The candidate was awarded **0 marks**. They did not correctly identify the integrated circuit as stated in the data sheet. The name of the individual gate 'NOR' on its own is not an acceptable response.

Question 4(a)(ii)

The candidate was awarded **1 mark** as they correctly identified an acceptable output pin.

Question 4(a)(iii)

The candidate was awarded **0 marks** as their response was incorrect.

Question 4(b)

The candidate was awarded **4 marks**. They correctly completed each column of the truth table and was awarded full marks.

Question 5(a)

The candidate was awarded **0 marks**. The candidate's response was incomplete and not sufficient to gain the mark.

Question 5(b)(i)

The candidate was awarded **1 mark**. They correctly identified wire 3 as the wire that should have blue insulation. Candidates should be familiar with standard wire colour conventions used throughout the course; red is used for positive supply (+V), black for the 0 V (ground) connection. Understanding these conventions helps candidates interpret stripboard layout diagrams.

Question 5(b)(ii)

The candidate was awarded **0 marks** as their response was not acceptable.

Question 5(b)(iii)

The candidate was awarded **1 mark**. They correctly stated that one probe should be connected to test point F. The candidate incorrectly stated that the other probe should be connected to the test point D. The candidate does not describe what position the dial should be set/turned to so cannot access the third mark.

Question 6

The candidate was awarded **2 marks**. They correctly identified that the LED is incorrectly orientated. The use of 'facing the wrong way' was acceptable. The candidate correctly identified that the supply voltage was wrong but did not state that it was too low. The statement of the resistance being too high with the 2M Ω identifier was sufficient to gain the second mark.

Question 7(a)

The candidate was awarded **3 marks**. They correctly stated the potential divider relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 7(b)

The candidate was awarded **0 marks**. They correctly stated that as temperature increases, the resistance of the thermistor decreases, but did not state that this causes the voltage across the thermistor to decrease so they could not access the first mark. The candidate does not state that the voltage across the variable resistor has increased, so cannot access the second mark. Although the candidate does state that the buzzer activates, the reason given is unclear and implies the resistance reaches the buzzer which is incorrect, so does not achieve the third mark.

Question 7(c)

The candidate was awarded **0 marks** as they gave no response.

Question 8

The candidate was awarded **5 marks** as they correctly completed all rows of the costings sheet.

Question 9

The candidate was awarded **4 marks**. The candidate's response was an acceptable attempt at a block/system diagram, not simply a list or table of components. The use of a ruler and straight lines to create the block diagram would have been best practice. The candidate correctly labelled the three subsections of the block diagram however, did not use dashed lines to separate each subsection appropriately so did not access the first mark. The candidate correctly selected the two input devices and correctly selected the two output devices. The candidate did not correctly select the two required gates to meet the specification. The candidate did correctly link the input devices to the gates. The candidate has been awarded the mark for correctly linking the gates to the output devices as showing a double output from the XOR gate block

is poor form and not incorrect. Best practice would have been to draw only one output line from the gate before splitting into two as shown in the marking instructions.

Question 10

The candidate was awarded **3 marks**. The candidate's response was an acceptable attempt at a layout diagram using the additional pre-printed template. The use of a ruler to draw straight lines in the layout diagram, where appropriate, would have been best practice. The candidate accessed the first mark by labelling all components shown using the appropriate component labels. The incorrect spelling in the naming of the capacitor has been ignored. The candidate has omitted the 'X' to indicate a cut track underneath component R_2 , so is unable to access the second mark. The candidate did not access the third mark for correctly showing SW_1 , with solder points, connected across C_1 and connected to 0 V with appropriate links, breaks and connected to R_2 . This is because the push switch has an incorrect footprint with no solder points. The candidate accessed the fourth mark for correctly showing the branch containing R_1 and C_1 with appropriate links and breaks. The candidate accessed the fifth mark for correctly showing the connections of TR_1 to 0 V and +V through buzzer, with appropriate links and breaks.

Candidate 3

Question 1(a)

The candidate was awarded **3 marks**. They correctly identified the resistor, correctly drew the ammeter symbol and correctly described the function of the light dependent resistor as changing resistance with a change to light intensity.

Question 1(b)(i)

The candidate was awarded **1 mark**. They correctly determined the resistance of the resistor. The answer included the correct unit symbol.

Question 1(b)(ii)

The candidate was awarded **1 mark**. They correctly determined the value of the percentage tolerance, including the correct use of the $\pm$ symbol.

Question 1(b)(iii)

The candidate was awarded **2 marks**. They correctly determined the maximum value and minimum value of the resistance of the resistor.

Question 1(c)

The candidate was awarded **1 mark** as they correctly identified 2M2 as the largest value of resistance.

Question 2

The candidate was awarded **2 marks**. They correctly stated three valid responses.

Question 3(a)(i)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 3(a)(ii)

The candidate was awarded **3 marks**. They correctly stated the Ohm's Law relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 3(a)(iii)

The candidate was awarded **3 marks**. They correctly stated an appropriate power relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 3(b)(i)

The candidate was awarded **3 marks**. They correctly determined the value of the effective resistance. The candidate did not state an appropriate relationship however,

it can be implied due to the correct substitution of values, as per the general marking principles.

Question 3(b)(ii)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 4(a)(i)

The candidate was awarded **0 marks**. They did not correctly identify the integrated circuit as stated in the data sheet. The name of the individual gate 'NOR' on its own is not an acceptable response.

Question 4(a)(ii)

The candidate was awarded **0 marks** as their response was incorrect.

Question 4(a)(iii)

The candidate was awarded **1 mark** as they correctly identified the logic state as logic 1.

Question 4(b)

The candidate was awarded **4 marks**. They correctly completed each column of the truth table and was awarded full marks.

Question 5(a)

The candidate was awarded **1 mark**. The candidate's response was acceptable, indicating that colour coding is used to identify part(s) of a circuit that have the same potential/voltage/signal.

Question 5(b)(i)

The candidate was awarded **1 mark**. They correctly identified wire 3 as the wire that should have blue insulation. Candidates should be familiar with standard wire colour conventions used throughout the course; red is used for positive supply (+V), black

for the 0 V (ground) connection. Understanding these conventions helps candidates interpret stripboard layout diagrams.

Question 5(b)(ii)

The candidate was awarded **0 marks**. The candidate's response was insufficient as it made no reference to protecting the LED.

Question 5(b)(iii)

The candidate was awarded **0 marks**. The candidate's response did not describe how the multi-meter would be used to test for continuity between the LED and the 0V rail.

Question 6

The candidate was awarded **3 marks**. They correctly identified that the supply voltage was too low. The candidate correctly identified that the LED is incorrectly orientated. The candidate correctly identified that the resistor in series with the LED was too large a value of resistance.

Question 7(a)

The candidate was awarded **3 marks**. They correctly stated the potential divider relationship, substituted the values correctly and stated the correct final answer with correct unit symbol.

Question 7(b)

The candidate was awarded **2 marks**. They correctly stated that as temperature increases, the resistance of the thermistor decreases and stated that this causes the voltage across the thermistor to decrease so achieved the first mark. The candidate does not state that the voltage across the variable resistor has increased, so cannot access the second mark. The candidate stated the MOSFET activates, and achieved the third mark.

Question 7(c)

The candidate was awarded **0 marks**. The candidate's response did not state that it allows the user to control the temperature at which the circuit activates.

Question 8

The candidate was awarded **5 marks**. They correctly completed all rows of the costings sheet.

Question 9

The candidate was awarded **6 marks**. The candidate's response was an acceptable attempt at a block/system diagram, not simply a list or table of components. The use of a ruler and straight lines to create the block diagram would have been best practice. The candidate correctly labelled the three subsections of the block diagram and used separating lines to separate each subsection appropriately so accessed the first mark. The use of dashed lines, rather than solid lines, would have been best practice. The candidate correctly selected the two input devices. The candidate correctly selected the two output devices. The candidate correctly selected the two required gates to meet the specification. The candidate correctly linked the input devices to the gates and also correctly linked the gates to the output devices. The use of arrows in the block diagram were not required.

Question 10

The candidate was awarded **4 marks**. The candidate's response was an acceptable attempt at a layout diagram using the additional pre-printed template. The use of a ruler to draw straight lines in the layout diagram, where appropriate, would have been best practice. The candidate accessed the first mark by labelling all components shown using the appropriate component labels. The candidate has omitted the 'X' to indicate a cut track underneath component R_2 , so is unable to access the second mark. The candidate accessed the third mark for correctly showing SW_1 , with solder points, connected across C_1 and connected to 0 V with appropriate links, breaks and connected to R_2 . The candidate accessed the fourth mark for correctly showing the branch containing R_1 and C_1 with appropriate links and breaks. The candidate

accessed the fifth mark for correctly showing the connections of TR₁ to 0 V and +V through buzzer, with appropriate links and breaks.

Candidate 4

Question 1(a)

The candidate was awarded **3 marks**. They correctly identified the resistor, correctly drew the ammeter symbol and correctly described the function of the light dependent resistor as changing resistance with a change to light intensity.

Question 1(b)(i)

The candidate was awarded **1 mark**. They correctly determined the resistance of the resistor. The answer included the correct unit symbol.

Question 1(b)(ii)

The candidate was awarded **1 mark**. They correctly determined the value of the percentage tolerance, including the correct use of the $\pm$ symbol.

Question 1(b)(iii)

The candidate was awarded **2 marks**. They correctly determined the maximum value and minimum value of the resistance of the resistor.

Question 1(c)

The candidate was awarded **1 mark**. They correctly identified 2M2 as the largest value of resistance.

Question 2

The candidate was awarded **2 marks**. They correctly stated three valid responses.

Question 3(a)(i)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 3(a)(ii)

The candidate was awarded **1 mark**. They correctly stated the appropriate relationship for Ohm's Law. The substituted value for the resistance was incorrect, so the candidate did not access any further marks.

Question 3(a)(iii)

The candidate was awarded **3 marks**. They correctly stated an appropriate power relationship, substituted the values correctly and stated the correct final answer with correct unit symbol. General marking principle h was applied for this response – where an incorrect answer to part of a question is carried forward and the incorrect answer is then used correctly in the following part, the candidate should be given credit for the subsequent part or 'follow on'.

Question 3(b)(i)

The candidate was awarded **3 marks**. They correctly stated an appropriate relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 3(b)(ii)

The candidate was awarded **1 mark**. They correctly calculated the total value of the circuit resistance, including the correct unit symbol.

Question 4(a)(i)

The candidate was awarded **1 mark**. They correctly identified the integrated circuit as stated in the data sheet.

Question 4(a)(ii)

The candidate was awarded **1 mark** as they correctly identified an acceptable output pin.

Question 4(a)(iii)

The candidate was awarded **1 mark** as they correctly identified the logic state as logic 1.

Question 4(b)

The candidate was awarded **4 marks**. They correctly completed each column of the truth table and was awarded full marks.

Question 5(a)

The candidate was awarded **1 mark**. The candidate's response was acceptable indicating that colour coding is used to identify part(s) of a circuit that have the same potential/voltage/signal.

Question 5(b)(i)

The candidate was awarded **1 mark**. They correctly identified wire 3 as the wire that should have blue insulation. Candidates should be familiar with standard wire colour conventions used throughout the course; red is used for positive supply (+V), black for the 0 V (ground) connection. Understanding these conventions helps candidates interpret stripboard layout diagrams.

Question 5(b)(ii)

The candidate was awarded **0 marks**. Their description 'receiving too much volts' is technically incorrect.

Question 5(b)(iii)

The candidate has given a response but scored it out and referred the marker to "use additional answer". In line with the General Marking Principals, the scored-out response is ignored and the additional response on page 77 is marked in line with

the marking instructions. The candidate was awarded **1 mark**. They correctly state that one probe should be connected to the ground rail so gained one mark. The candidate incorrectly stated that the other probe should be connected to the positive side of the LED. The candidate does state that the multi-metre should be set to the continuity setting but does not describe what position the dial should be set/turned to so cannot access the third mark. The expected response was for candidates to identify which test points should be used however, alternative responses were accepted when appropriately described.

Question 6

The candidate was awarded **3 marks**. They correctly identified that the supply voltage was too low. The candidate correctly identified that the LED is incorrectly orientated. The candidate correctly identified that the resistor in series with the LED was too large a value of resistance.

Question 7(a)

The candidate was awarded **3 marks**. They correctly stated the potential divider relationship, substituted the values correctly and stated the correct final answer with the correct unit symbol.

Question 7(b)

The candidate was awarded **0 marks**. They correctly stated that as temperature increases, the resistance of the thermistor decreases, but does not state that this causes the voltage across the thermistor to decrease so cannot access the first mark. The candidate does not state that the voltage across the variable resistor has increased, so cannot access the second mark. The description that voltage moves through the MOSFET to activate it is incorrect so the candidate did not access the third mark.

Question 7(c)

The candidate was awarded **0 marks**. Their response of altering the sensitivity of the MOSFET was incorrect.

Question 8

The candidate was awarded **5 marks** as they correctly completed all rows of the costings sheet.

Question 9

The candidate was awarded **6 marks**. The candidate's response was an acceptable attempt at a block/system diagram, not simply a list or table of components. The use of a ruler and straight lines to create the block diagram would have been best practice. The candidate correctly labelled the three subsections of the block diagram and used dashed separating lines to separate each subsection appropriately so accessed the first mark. The candidate correctly selected the two input devices and correctly selected the two output devices. The candidate correctly selected the two required gates to meet the specification. The candidate correctly linked the input devices to the gates and also correctly linked the gates to the output devices.

Question 10

The candidate was awarded **5 marks**. The candidate's response was an acceptable attempt at a layout diagram using the additional pre-printed template. The use of a ruler to draw straight lines in the layout diagram, where appropriate, would have been best practice. The candidate accessed the first mark by labelling all components shown using the appropriate component labels. The candidate correctly placed an 'X' to indicate a cut track underneath component R_2 , accessing the second mark. The candidate accessed the third mark for correctly showing SW_1 , with solder points, connected across C_1 and connected to 0 V with appropriate links, breaks and connected to R_2 . The candidate accessed the fourth mark for correctly showing the branch containing R_1 and C_1 with appropriate links and breaks. The candidate accessed the fifth mark for correctly showing the connections of TR_1 to 0 V and +V through buzzer, with appropriate links and breaks.

Candidate 5

Question 1(a)

The candidate was awarded **2 marks**. They correctly identified the resistor and correctly drew the ammeter symbol. However, no mark was awarded for the function of the light dependent resistor (LDR), as the response did not state that the LDR changes its resistance with changes in light intensity, as required by the marking instructions. The key word omitted was resistance.

Question 1(b)(i)

The candidate was awarded **1 mark**. They correctly determined the resistance of the resistor as 1500 Ω . The answer included the correct ohms unit, satisfying the additional guidance. Other accepted formats included 1500 R, $1.5 \times 10^3 \Omega$ and 1K5.

Question 1(b)(ii)

The candidate was awarded **0 marks** as they incorrectly identified the percentage tolerance as $\pm 5\%$. The silver tolerance band indicates a tolerance of $\pm 10\%$. The additional guidance states that 10 would also have been accepted without the percentage symbol, as the word 'percentage' is already given in question; however, - 10 or +10 on their own would not be awarded the mark.

Question 1(b)(iii)

The candidate was awarded **2 marks**. Although the candidate incorrectly identified the tolerance in part (ii), they correctly applied their answer consistently when calculating the maximum and minimum resistance values. In line with the marking instructions, both marks were awarded through the application of the follow-on (carry-forward) principle.

Question 1(c)

The candidate was awarded **1 mark**. They correctly identified 2M2 as the largest value of resistance. In line with the additional guidance, equivalent responses in different formats were accepted, and a circle around the correct answer was sufficient to gain the mark.

Question 2

The candidate was awarded **2 marks**. They identified two valid safety precautions by stating that there should be sufficient ventilation and the soldering iron stand is used. The candidate also stated that a heat-proof mat should be used, which is another acceptable response.

Question 3(a)(i)

The candidate was awarded **1 mark** as they correctly calculated the total resistance of the circuit as $36\ \Omega$. The answer included the correct unit, as required by the marking instructions.

Question 3(a)(ii)

The candidate was awarded **2 marks**. They correctly selected Ohm's Law and substituted the values into the equation. However, no mark was awarded for the final answer as the calculation was incorrect. To gain full marks, the candidate was required to calculate the current as 0.25 A not 4 A . The marking instructions also accepted answers consistent with the candidate's response to part (i), where appropriate.

Question 3(a)(iii)

The candidate was awarded **0 marks**. They attempted to calculate the power dissipated in resistor R_3 but did not demonstrate a correct method. The response did not include a valid substitution of values into an appropriate relationship, and the final answer was incorrect. Consequently, no marks were awarded. In accordance with the marking instructions, marks were available for selecting an appropriate relationship, correctly substituting values, and determining the correct final answer, including the unit.

Question 3(b)(i)

The candidate was awarded **3 marks**. They correctly applied the equation for calculating the effective resistance of two resistors in parallel, correctly substituted the resistor values and determined the effective resistance as $4\ \Omega$.

Question 3(b)(ii)

The candidate was awarded **1 mark**. They correctly calculated the overall circuit resistance as $20\ \Omega$ by adding the effective parallel resistance to the series resistor. The answer included the correct unit, as required by the marking instructions. Although the handwritten digit '4' in the working could be mistaken for a '9', the marker was able to identify it as a '4' by considering the candidate's handwriting elsewhere in the question paper.

Question 4(a)(i)

The candidate was awarded **1 mark**. They correctly identified the integrated circuit as a '7402 quad 2-input NOR gate', as stated in the data sheet. Although the full name was provided, the IC number '7402' on its own would also be sufficient to gain the mark, but best practice is to give the full description. Candidates should note that 'NOR' on its own is not accepted.

Question 4(a)(ii)

The candidate was awarded **1 mark**. They correctly identified pin 1 as an output pin on the integrated circuit. This is one of the accepted responses in the marking instructions. Had the candidate identified more than one output pin, the mark would still have been awarded provided all additional responses were also correct. However, if an incorrect pin had also been identified, general marking principle (j) would have applied, and any incorrect response would have negated the correct response.

Question 4(a)(iii)

The candidate was awarded **1 mark**. They correctly identified the logic state at pin 11 as 1. This is the expected response regarding the given input conditions and the mark was awarded.

Question 4(b)

The candidate was awarded **4 marks**. They correctly completed each column of the truth table and was awarded full marks. The candidate's working is clear and systematic, making it straightforward to follow the logic through the circuit and columns. It is also good practice (but not required) for candidates to identify and label each logic gate (for example, AND, OR or XOR) inside the logic gate shape before completing the truth table. Candidates may also find it helpful to use spare pencils to cover unused columns and a ruler to keep their place when transferring values across the table rows. These techniques can help reduce errors and improve accuracy when completing this type of question.

Question 5 (a)

The candidate was awarded **0 marks**. They recognised that colour coding helps to distinguish between wires but did not provide sufficient explanation to meet the requirements of the marking instructions. To gain the mark, responses needed to explain that colour coding is used to identify wires between subsystems, identify parts of a circuit with the same potential/voltage or signal, follow the same signal or logic state through a circuit, or test the continuity of the same wire between subsystems or components.

Question 5 (b)(i)

The candidate was awarded **1 mark**. They correctly identified wire 3 as the wire that should have blue insulation. Candidates should be familiar with standard wiring colour conventions used throughout the course; red is used for the positive supply (+V), black for the 0 V (ground) connection, and therefore blue is the signal wire in this case. Understanding these conventions helps candidates interpret stripboard layouts and identify the correct connections in circuit diagrams.

Question 5 (b)(ii)

The candidate was awarded **1 mark**. They correctly stated that the resistor protects the LED, which is one of the accepted responses in the marking instructions. Candidates should understand that the resistor protects the LED by limiting the current flowing through it (or by reducing the voltage across the LED), preventing

damage. Centres should reinforce that candidates' responses must specifically refer to the LED, as generic statements about current or voltage are not sufficient.

Question 5 (b)(iii)

The candidate was awarded **1 mark**. They recognised that the continuity test should be carried out between the LED and the 0 V rail, demonstrating an understanding of the purpose of the test. However, the question specifically required the candidate to identify the test points shown on the stripboard (E and F) rather than describing the components or rail. The candidate also did not identify the correct continuity dial setting on the multimeter. As a result, only 1 mark was awarded.

Centres should ensure candidates read the wording of the questions carefully. Where test points are labelled on a stripboard, candidates should refer to these labels (for example, test points E and F) rather than describing component locations.

Candidates should also be familiar with selecting the correct continuity mode on a multimeter and recognise the different styles of continuity symbols (diode and quaver music symbol).

Question 6

The candidate was awarded **2 marks**. They correctly identified that the supply voltage was too low and that the protective resistor for the LED was too high, both of which matched the expected responses in the marking instructions. The third response, 'wrong symbol for LDR', was incorrect as this is an accepted symbol for an LDR.

Centres should encourage candidates to study circuit diagrams carefully and be aware of different styles of component symbols, and also use the word 'value' when describing how high or low a voltage or resistance is.

Question 7(a)

The candidate was awarded **3 marks**. They correctly selected the voltage divider equation, substituted the given resistor and supply voltage value, and calculated the correct voltage across the variable resistor as 3 V. Candidates should be familiar with both accepted methods for solving voltage divider calculations, as show in the

marking instructions. They should clearly substitute the given values into the chosen equation, show each stage of their working, and include the correct unit in their final answer. Clear working allows marks to be awarded even if a later arithmetic error is made.

Question 7(b)

The candidate was awarded **0 marks**. The response showed a general understanding that the thermistor senses temperature and that the buzzer eventually sounds. However, it did not describe the sequence of circuit operation fully enough, as required by the marking instructions. The candidate incorrectly stated that the variable resistors resistance decreases, whereas it is the thermistors resistance that decreases as the temperature increases. They also referred to the MOSFET as a 'push to make' switch and did not clearly explain that as the voltage across the variable resistor increases, it causes the MOSFET to switch on and allow current to flow through the buzzer.

Candidates should be encouraged to explain the operation of electronic circuits in a logical sequence, working from left to right of the diagram and explain how one change leads to the next. For this voltage divider circuit, they should identify which component changes resistance, explain how this affects the voltage across each component, and then describe how this change switches the output device on or off.

Question 7(c)

The candidate was awarded **0 marks**. The response focused on changing the resistance to saturate another resistor, which did not answer the question. The marking instructions required candidates to state that the variable resistor is used to set or adjust the temperature at which the buzzer sounds. Candidates should recognise that variable resistors are commonly used to adjust or calibrate the switching point of sensing circuits. In this context, changing the variable resistor alters the trigger temperature, allowing the temperature at which the buzzer operates to be set.

Question 8

The candidate was awarded **5 marks**. They correctly completed all five missing rows of the costing sheet by selecting the lowest-cost component from the two suppliers' catalogues. The correct supplier, component, product code and cost were given for each row. In accordance with the marking instructions, 1 mark was awarded for each fully correct row.

Question 9

The candidate was awarded **4 marks**. They correctly identified the input, process and output sections of the system and correctly selected both input devices (temperature sensor and manual switch) and both output devices (heating element and LED). They also linked both inputs to gates correctly (even if the gates were incorrect). However, the candidate selected one of the gates incorrectly. The temperature sensor was correctly connected to a NOT gate, but the second gate was incorrectly identified as an OR gate instead of an AND gate. As a result, the process stage did not meet the requirements of the specification, and the outputs were not correctly linked to the appropriate logic gate.

Candidates should carefully interpret the logic requirements described in the question before selecting gates. In this example, the heating element and LED should only operate when both conditions are satisfied: the water is logic 0 for cold, requiring the temperature sensor output to be inverted using a NOT gate. This requires the output of the NOT gate and the manual switch to feed an AND gate before giving both output devices a logic 1 for ON. Remember dash lines (- - -) are used to divide the three sections of a systems block diagram and logic gate symbols are not required, only block form.

Question 10

The candidate was awarded **1 mark**. They correctly connected the buzzer between the +V rail and the transistor collector leg and the emitter leg to 0 V, so the mark for connecting TR₁ to 0 V and +V through the buzzer was awarded.

No mark was awarded for the remaining sections. The components were not labelled as required, no track break was shown across R_2 and the switch solder points and capacitor were not correctly connected in parallel (note the line only touches the edge of the switch) with the required links to 0 V and R_2 . The branch containing R_1 and C_1 was also incorrect, as you cannot put more than one wire into one stripboard hole.

Candidates should transfer the circuit diagram to the stripboard systematically, checking each electrical node in turn. Each component must be clearly labelled, track breaks should be marked with an 'X', and the component footprint should be an appropriate size. It is also important to check polarity-sensitive components, particularly the electrolytic capacitor, and to ensure that all links reproduce the circuit connections exactly. This could be a good practical task for centres to do, to allow candidates to go and build their given layout diagram and identify any faults.

Candidate 6

Question 1(a)

The candidate was awarded **3 marks**. They correctly identified the missing component as a resistor, drew the correct ammeter symbol, and accurately described the function of the light dependent resistor (LDR) by stating that its resistance changes with the light level.

Centres should ensure that candidates learn both the names and standard circuit symbols of common electronic components, as these are regularly assessed. When describing the function of an LDR, candidates should refer to its resistance changing in response to light intensity, rather than simply stating that it 'detects light' or 'is affected by light', as further explanation is required to gain the mark. Clear, concise descriptions that identify the electrical property changing are essential. 'LURD' on its own is not acceptable.

Question 1(b)(i)

The candidate was awarded **1 mark**. They correctly determined the resistor value as $1500\ \Omega$ and showed their working on the first line using the resistor colour code. The final answer is clearly identified by being double underlined, making it easy for the marker to locate.

Centres should encourage candidates to show their working when decoding resistor colour bands and to clearly identify their final answer. Presenting answers neatly with the correct unit is good examination practice.

Question 1(b)(ii)

The candidate was awarded **1 mark**. They correctly identified the resistor tolerance as $\pm 10\%$.

Centres should ensure candidates are familiar with resistor tolerance colours and understand that the percentage value should include the $\pm$ symbol.

Question 1(b)(iii)

The candidate was awarded **2 marks**. They correctly calculated both the maximum resistance ($1650\ \Omega$) and the minimum resistance ($1350\ \Omega$), with clear, logical working shown throughout. The final answers are double underlined, making it straightforward for the marker to identify.

Centres should encourage candidates to lay out calculations in a logical sequence, showing each step before clearly identifying the final answer. Good presentation, double underlining, helps markers follow the candidate's method and is particularly beneficial in multi-stage calculation questions.

Question 1(c)

The candidate was awarded **1 mark**. They correctly identified 2M2 as the largest resistance value.

Centres should provide candidates with regular opportunities to practise interpreting resistor values written in different notations. Candidates should be encouraged to compare values by converting them into a common unit where necessary.

Question 2

The candidate was awarded **2 marks**. They correctly identified two valid safety precautions; using an extraction fan and wearing safety glasses.

Centres should ensure that candidates are familiar with a range of workshop safety precautions associated with soldering. Regular reinforcement of safe working practices during practical activities throughout the year will help candidates recall these measures in the exam.

Question 3(a)(i)

The candidate was awarded **1 mark**. They correctly identified that, with switch S open, only R_1 ($20\ \Omega$) and R_3 ($16\ \Omega$) are in the series circuit and correctly calculated the total resistance as $36\ \Omega$. The working is concise and the final answer is clearly underlined.

Centres should ensure candidates understand how switches affect current paths and can identify which components are included in the circuit before attempting any calculations. Encouraging candidates to sketch or trace the current path can help avoid including components that are isolated by an open switch.

Question 3(a)(ii)

The candidate was awarded **3 marks**. They selected the correct equation, $V = IR$, correctly rearranged it to calculate the current, substituted the appropriate values and obtained the correct answer of 0.25 A . The method is clearly presented, with the final answer highlighted.

Centres should encourage candidates to show each stage of their calculation, including the formula used, any rearrangements, substitution and final answer with units. This approach allows markers to award method marks where appropriate and support follow-through marking if an earlier calculation is incorrect.

Question 3(a)(iii)

The candidate was awarded **3 marks**. They selected the correct power equation, $P = I^2R$, substituted the current calculated in part (ii) and the correct resistor value, and finally calculated the power dissipated in R_3 as 1 W.

Question 3(b)(i)

The candidate was awarded **3 marks**. They correctly identified that R_1 and R_2 are connected in parallel and applied the correct reciprocal formula. The working is well structured, progressing logically to the correct effective resistance of 4 Ω , which is clearly underlined.

Centres should reinforce the importance of recognising series and parallel resistor combinations before beginning calculations. Candidates should be encouraged to show each step of their working, particularly when using reciprocal equations, as this supports the award of method marks.

Question 3(b)(ii)

The candidate was awarded **1 mark**. They correctly recognised that the equivalent parallel resistance calculated in part (i) is in series with R_3 , and accurately calculated the overall circuit resistance as 20 Ω .

Centres should encourage candidates to use answers from previous parts where appropriate and to clearly identify the final answer. This reinforces the logical sequence of multi-stage circuit calculations and helps candidates demonstrate their understanding of series and parallel resistor networks.

Question 4(a)(i)

The candidate was awarded **1 mark**. They correctly identified the integrated circuit as a 7402 Quad 2-input NOR gate, providing the full description required by the marking instructions.

Centres should encourage candidates to provide the complete identification of an integrated circuit rather than naming only the logic gate, as the marking instructions require both the device number and the gate configuration.

Question 4(a)(ii)

The candidate was awarded **1 mark**. They correctly identified pin 1 as an output pin on the integrated circuit layout diagram.

Centres should ensure candidates are confident in interpreting IC pinout diagrams and distinguishing between input, output and power supply pins by referring carefully to the datasheet provided.

Question 4(a)(iii)

The candidate was awarded **1 mark**. They correctly identified that the output at pin 11 is logic state 1 when both pins 12 and 13 are at logic state 0.

Centres should provide opportunities for candidates to practise determining input and output logic values from pinout diagrams, reinforcing the relationship between input/output combinations and the resulting logic state, Logic Probes can be used to reinforce the learning.

Question 4(b)

The candidate was awarded **4 marks**. They correctly completed all four output columns of the truth table.

It is good practice, although not required, for candidates to identify and label each logic gate, for example AND, XOR and OR, inside the gate shapes before completing the truth table. Candidates may also find it helpful to use spare pencils to cover unused columns and a ruler to keep their place when transferring values across each row. These techniques can reduce confusion and improve accuracy when completing the truth table.

Question 5 (a)

The candidate was awarded **1 mark**. They correctly stated that colour coding makes it easier to identify signals during testing, which matches the accepted responses in the marking instructions.

Candidates should be encouraged to use precise terminology, referring to identifying signals, voltages or common connections within a circuit. A concise, technical response is needed to gain full marks.

Question 5 (b)(i)

The candidate was awarded **1 mark**. They correctly identified wire 3 as the wire that should have blue insulation.

Candidates should first identify the power supply rails, recognising that red is conventionally used for the positive (+5 V) supply and black for the 0 V (ground) connection. Once these have been identified, the remaining connections can be recognised as the signal wires, which should be coloured blue in this case. Following this systematic approach helps candidates accurately identify the correct wire colour and reduces errors.

Question 5 (b)(ii)

The candidate was awarded **1 mark**. They correctly stated that the resistor limits the current flowing through the LED, preventing excessive current that could damage the component.

Candidates should be encouraged to reference the LED explicitly in their response, for example by stating that the resistor limits the current through the LED, reduces the voltage across the LED, or protects the LED. Responses that simply state 'limits the current' without mentioning the LED are not sufficient.

Question 5 (b)(iii)

The candidate was awarded **3 marks**. They clearly identified the correct test points (E and F) and selected the correct continuity/diode test setting on the multimeter. Their explanation also demonstrated an understanding that a beep indicates continuity.

Question 6

The candidate was awarded **3 marks**. They correctly identified that the supply voltage value is too small by stating the correct value required. The LED polarity/orientation is incorrect, and that the protective resistor for the LED has too large a value. All three responses matched the marking instructions. They also correctly referred to the resistor value being too high, rather than simply stating that the resistor itself was 'too large'. Candidates should use the word 'value' when describing whether a voltage or resistance is either too high or too low.

Question 7(a)

The candidate was awarded **3 marks**. They correctly selected the voltage divider equation, substituted the resistance values and supply voltage, and calculated the voltage across the variable resistor as 3 V. The working is clearly structured, and the final answer is distinctly underlined.

Candidates should be encouraged to show the equation, substitution and final answer as separate stages. This clear layout makes the method easy to follow and allows individual method marks to be awarded where appropriate.

Question 7(b)

The candidate was awarded **3 marks**. They clearly explained the operation of the circuit in the correct sequence. The candidate stated that, as the temperature increases, the thermistor resistance decreases; consequently, the voltage across the thermistor decreases and the voltage across the variable resistor increases. They then explained that the MOSFET conducts, allowing current to flow through the buzzer.

This response demonstrates effective examination technique because it works logically through the circuit from the sensing component and voltage divider to the output device, ie left to right. Candidates should be encouraged to explain circuit operation in this sequence: input change, effect on resistance or voltage, switching action, then output operation. Although the candidate referred to a switching value of 2 V, the additional marking instruction guidance states that any switching voltage value should be ignored, as this depends on the type of MOSFET used.

Question 7(c)

The candidate was awarded **1 mark**. They correctly stated that the variable resistor is used to calibrate the circuit so that it triggers at the required temperature. This is equivalent to setting or adjusting the temperature at which the buzzer sounds, as required by the marking instructions.

Candidates should recognise that a variable resistor in a sensing circuit is commonly used to adjust the switching point or trigger level.

Question 8

The candidate was awarded **5 marks**. They correctly completed all five missing rows by selecting the lowest-cost suitable component from the two suppliers' catalogues. For each row, the candidate provided the correct supplier, product code and cost, in line with the marking instructions.

Question 9

The candidate was awarded **6 marks**. They correctly identified the input, process and output sections, selected the correct components, and linked them logically. The temperature sensor was inverted using a NOT gate before combining with the manual switch in to the AND gate, with the output driving both the heating element and LED.

Candidates should clearly separate a systems block diagram into the input, process and output sections using clear headings and dividing dash lines (- -) between the three sections, also present the block diagram as neatly as possible, use a ruler

where you can. Remember logic gates should only have one output line from them, this is then branched off to more than one output, if required.

Question 10

The candidate was awarded **5 marks** for producing a complete and accurate stripboard layout. All required components were correctly labelled and positioned, with the necessary track breaks, links and connections shown. The transistor, buzzer and power rails were also connected correctly in accordance with the marking instructions.

Candidates should clearly label all components (for example, R1, R2, C1, SW1, TR1) and ensure all required track breaks, links and power rail labels (+V and 0 V) are included. A neat, well-spaced layout makes the intended circuit easier to interpret and mark.

Candidate 7

Question 1(a)

The candidate was awarded **2 marks**. They correctly identified the resistor and drew the ammeter symbol. However, no mark was awarded for the function of the LDR as the response described its effect on current rather than stating that its resistance changes with light intensity.

Question 1(b)(i)

The candidate was awarded **1 mark**. They correctly determined the resistance value from the resistor colour code.

Question 1(b)(ii)

The candidate was awarded **1 mark**. They correctly identified the resistor tolerance.

Question 1(b)(iii)

The candidate was awarded **2 marks**. They correctly calculated both the maximum and minimum resistance values. Candidates should clearly identify the upper and

lower tolerance values. Showing full working is encouraged but not required to gain the 2 marks.

Question 1(c)

The candidate was awarded **1 mark** as they correctly identified the largest resistance value. Centres should continue to provide opportunities for candidates to compare resistor values written in different resistor notations.

Question 2

The candidate was awarded **1 mark**. They correctly identified the need to wear safety goggles. However, the second response relating to avoiding contact with the soldering iron, was too general and did not match the accepted safety precautions listed in the marking instructions.

Candidates should be encouraged to give recognised workshop safety precautions, such as using a soldering iron stand, heat-proof mat, eye protection or working in a well-ventilated area, rather than general statements about being careful.

Question 3(a)(i)

The candidate was awarded **1 mark**. They correctly calculated the total circuit resistance when the switch was open. Centres should reinforce identifying series or parallel circuits before carrying out any resistance calculations.

Question 3(a)(ii)

The candidate was awarded **1 mark**. They selected the correct relationship, $V = IR$, but used an incorrect resistance value, leading to an incorrect current calculation. As a result, only the method mark was awarded.

Candidates should be encouraged to use answers from previous parts where appropriate and to check that the correct total circuit resistance has been used before performing subsequent calculations.

Question 3(a)(iii)

The candidate was awarded **0 marks**. They attempted to calculate power but used incorrect values and an inappropriate substitution, so no marks could be awarded. Candidates should identify the correct resistor and use values calculated earlier in the question. Practising multi-stage calculations will help reduce errors being carried forward.

Question 3(b)(i)

The candidate was awarded **3 marks**. They correctly calculated the effective resistance of the two parallel resistors using the correct formula method, with clear and accurate working throughout.

Candidates should continue to be encouraged to show each stage of parallel resistance calculations clearly to gain full method marks.

Question 3(b)(ii)

The candidate was awarded **1 mark**. They correctly determined the overall circuit resistance by adding the equivalent parallel resistance to the series resistor.

Centres should reinforce the importance of recognising when parallel and series sections must be combined separately before calculating the total circuit resistance.

Question 4(a)(i)

The candidate was awarded **1 mark**. They correctly identified the IC as a 7402 quad 2-input NOR gate.

Candidates should give the correct IC number and full gate description. NOR gate on its own is not sufficient.

Question 4(a)(ii)

The candidate was awarded **1 mark**. They correctly identified pin 13 as an output pin.

Question 4(a)(iii)

The candidate was awarded **1 mark**. They correctly stated that the input at pin 11 is logic state 1 when the input at pin 12 is logic state 0 and the output pin 13 is logic 0.

Regular practice using truth tables alongside IC pinout diagrams will help candidates link input or output states to the correct input or output pin.

Question 4(b)

The candidate was awarded **4 marks**. They correctly completed all four columns, D, E, F and Z, with each column matching the marking instructions.

Candidates should work through truth tables one column at a time. It is also good practice to label the gate types on the circuit diagram and use spare pencils to cover unused columns, with a ruler to help track each row accurately.

Question 5 (a)

The candidate was awarded **0 marks**. Their response referred to distinguishing wires when there are many wires but did not identify an accepted advantage such as identifying wires between subsystems, following the same signal or assisting with continuity testing.

Candidates should use terminology from the course, such as identifying wires between subsystems, following the same signal or voltage, or assisting with continuity testing, rather than giving general descriptions.

Question 5 (b)(i)

The candidate was awarded **1 mark** as they correctly identified wire 3 as the blue wire.

Question 5 (b)(ii)

The candidate was awarded **0 marks**. Although they recognised that the resistor prevents the LED from exceeding a limit, the response was too vague and did not

state the accepted function of limiting the current through the LED, reducing the voltage across the LED, or protecting the LED.

Candidates should be encouraged to use precise electrical language. Responses should explicitly state that the resistor limits the current through the LED (or protects the LED by limiting the current), rather than using vague phrases such as 'stops it going over its threshold'.

Question 5 (b)(iii)

The candidate was awarded **2 marks**. Even though they didn't specifically state the test point, they correctly identified the wire number on the stripboard. They did not however, specify the correct continuity meter setting using the symbol shown on the multimeter, losing the final mark.

Candidates should refer to the labelled test points rather than wire numbers and always include the correct multimeter dial setting when describing a continuity test.

Question 6

The candidate was awarded **2 marks**. They correctly identified that the supply voltage was too small of a unit and that the LED was connected the wrong way, ie incorrect polarity. They did not however, identify that the protective resistor for the LED had too high a value.

Candidates should inspect every component systematically when identifying circuit errors, checking supply values, component values and orientation, as these are common errors.

Question 7(a)

The candidate was awarded **3 marks**. The correct voltage-divider relationship was selected, the values were substituted accurately, and the final answer of 3 V was correct. The candidate also clearly identified the known values, which helped to organise the calculation.

Candidates should be encouraged to identify the known values before selecting and applying the appropriate formula from the given datasheet.

Question 7(b)

The candidate was awarded **0 marks**. They correctly stated that the thermistor resistance decreases as the temperature increases however, they did not explain how this affects the voltages across the thermistor. The reference to a 'PTM switch' was also incorrect and did not identify the MOSFET shown in the circuit. Also making a buzzer louder is incorrect terminology, it is either ON or OFF.

Question 7(c)

The candidate was awarded **0 marks**. They stated that the variable resistor changes the resistance and affects the loudness of the buzzer. This is not its purpose in the circuit. The variable resistor is used to set or vary the temperature at which the MOSFET switches on and the buzzer sounds.

Candidates should understand that a variable resistor in a sensing potential divider adjusts the switching threshold rather than the volume of the output device.

Question 8

The candidate was awarded **5 marks**. They correctly completed all five missing rows by selecting the lowest-cost suitable component from the two suppliers' catalogues. For each row, the candidate provided the correct supplier, product code and cost, in line with the marking instructions.

Question 9

The candidate was awarded **3 marks**. They correctly identified both input devices (temperature sensor and manual switch), both output devices (heating element and LED), and correctly linked the XOR gate output to both output devices. However, no mark was awarded for identifying the three system sections, as the input, process and output sections were not clearly separated using dashed lines. In addition, the incorrect logic gate (XOR) was selected instead of an AND gate. The candidate also incorrectly joined the two input signals together before entering the XOR logic gate. Each input to a two-input logic gate must be connected separately to its own input and must not be merged into a single connection.

Candidates should be encouraged to clearly separate the input, process and output sections of a systems block diagram using dashed lines (- - -). When connecting logic gates, each input must be shown entering a separate input of the gate. Candidates should avoid joining two signal lines together before a two-input gate, as this does not represent correct logic circuit operation.

Question 10

The candidate was awarded **4 marks**. They correctly labelled the components, the branch containing R_1 and C_1 was correctly constructed, and the transistor and buzzer were connected appropriately to the supply rails. However, 1 mark was lost because the required stripboard break across R_2 was omitted. This break is essential to isolate the copper tracks and ensure the circuit operates as intended.

Candidates should be reminded to check that all required stripboard breaks have been included, as omitting a single break can create unintended connections and result in an incorrect layout.