



Pearson

Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE
In Design and Technology (5EP02)
Paper 1 Electronic Products

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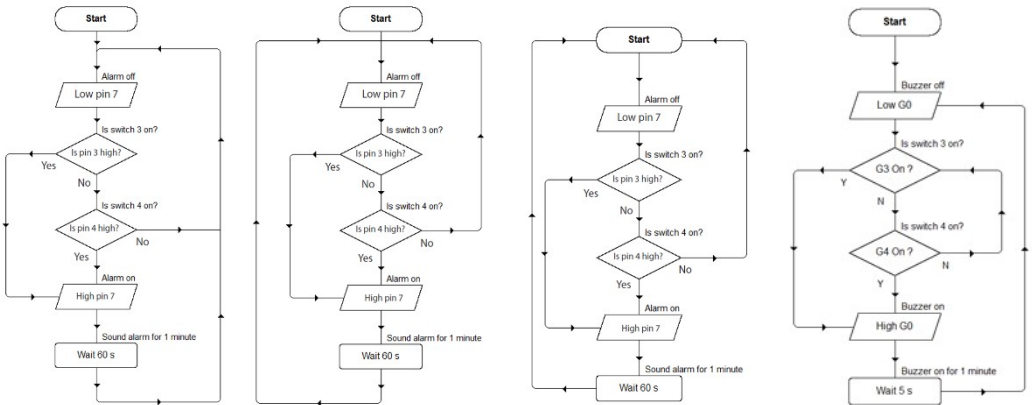

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1	B	(1)
Question Number	Answer	Mark
2	B	(1)
Question Number	Answer	Mark
3	D	(1)
Question Number	Answer	Mark
4	A	(1)
Question Number	Answer	Mark
5	B	(1)
Question Number	Answer	Mark
6	A	(1)
Question Number	Answer	Mark
7	C	(1)
Question Number	Answer	Mark
8	C	(1)
Question Number	Answer	Mark
9	C	(1)
Question Number	Answer	Mark
10	C	(1)

Question Number	Answer		Mark
11(a)	Heat shrink tubing	Insulates/protects/strengthens/covers/encases wires/cables/joints/components/connections Used for cable management/bundling up wires	4
	Wire stripper(s)	Used to remove insulation from wire	
	IC (DIL) socket	Accept synonyms for the following: Used to: hold/house/insert/connect/mount(ing) an IC/chip hold/house/insert/connect/mount(ing) a named IC/chip such as PIC, Op Amp or 555 timer Used to protect IC/chip from soldering/heat damage Used so IC/chip can be replaced/removed	
	Bubble Etching/Etch Tank Etching/Etch Tank	Equipment used to chemically remove copper and produce printed circuit boards (PCBs)	
4x1			

Question Number	Answer	Mark
11(b)	<ul style="list-style-type: none"> Buzzer (not piezo buzzer) 	1
Question Number	Answer	Mark
11(c) i	<ul style="list-style-type: none"> 1 mark for each line/route (2 x 1) 1 mark for correct arrow(s) on each line (2 x 1) <p>For the award of arrow mark(s) line(s) must be correct</p>  <ul style="list-style-type: none"> Other appropriate solutions/routes should be accepted Do NOT credit lines which cross other lines If candidate draws lines which are both valid routes but cross, only credit one One direction arrow per line is sufficient if correct Opposing arrows on same line – no credit for arrow marks Accept any style of line as long as route is correct <u>Correct route with mistake(s) (1) marks max</u> <u>Correct routes with mistake(s) (3) marks max</u> 	4
Question Number	Answer	Mark
11(c) ii	<p>Correctly add OR logic gate</p>  <ul style="list-style-type: none"> Must be correct symbol (with curves) – do not credit 'OR' within wrong shape (award credit if it is written within correct symbol) If there is more than one symbol credit first one (top or left) 	1

Question Number	Answer	Mark
11(d)	<p>Any 4 of the following:</p> <ul style="list-style-type: none"> • Granules/beads/pellets/beads _____ are poured into the hopper/machine • The granules/plastic are heated/melted • The screw/machine moves the granules/plastic forward ____ • The plasticised (melted) material/plastic is forced/injected into the mould/hydraulic ram operates (<i>concept of pressure is important here</i>) • The mould is cooled (water flowing through mould)/plastic sets (NOT dries) • The ram is withdrawn/the mould opens/separates • _____The hardened product is ejected/removed from the mould • The mould closes <p>Accept any order</p> <ul style="list-style-type: none"> • <u>Do NOT accept references to the removal/rotation of the mould</u> • <u>A 'rotating' mould may not exclude credit in other areas – look for evidence</u> • NO credit for description of <u>clearly incorrect</u> process e.g. vacuum forming • <u>Concise answers may be acceptable if they contain sufficient information to understand that the process of injection moulding is being described</u> • Do NOT accept pre-process or post-process operations such as mould manufacture/installation or de-flashing 	4
Question Number	Answer	Mark
11(e) i	<p>Any one (<u>or more</u>) of the following:</p> <ul style="list-style-type: none"> • Ω • Ohm • ohm • Ohms • ohms 	1

Question Number	Answer	Mark				
11(e) ii	<p>Correct answer with at least one stage of correct working (2 marks) A correct answer without working or with partially correct working (1 mark) A correct answer with erroneous working, with no understanding (0 marks) NO credit for incorrect answer NO penalty for omission of unit Accept standard form</p> <table border="1" data-bbox="264 533 1366 837"> <tr> <td data-bbox="264 533 850 786"> $R_{total} = 10,000 \times 10,000 / 10,000 + 10,000$ $R_{total} = 10k \times 10k / 10k + 10k$ <p style="text-align: center;">Or</p> $1/R_{total} = 1/10,000 + 1/10,000$ $1/R_{total} = 1/10k + 1/10k$ </td> <td data-bbox="855 533 1366 786"> Correct substitution of values into the formula for resistors in parallel. Accept appropriate alternatives if answer is correct. (1) </td> </tr> <tr> <td data-bbox="264 792 850 837"> $R_{total}/R_t/R = 5000$ or $5k$ </td> <td data-bbox="855 792 1366 837"> Correct answer (1) </td> </tr> </table> <p>Exemplar worked answers (2 marks):</p> $1/R_{total} = 1/10,000 + 1/10,000$ $1/R_{total} = 0.0001 + 0.0001$ $1/R_{total} = 0.0002$ $R_{total} = 1/0.0002$ $R_{total} = 5000$ (2 marks) $\frac{10k \times 10k}{10k + 10k} = 5k$ (2 marks) $\frac{10 \times 10}{10 + 10} = 5k$ (1 mark)	$R_{total} = 10,000 \times 10,000 / 10,000 + 10,000$ $R_{total} = 10k \times 10k / 10k + 10k$ <p style="text-align: center;">Or</p> $1/R_{total} = 1/10,000 + 1/10,000$ $1/R_{total} = 1/10k + 1/10k$	Correct substitution of values into the formula for resistors in parallel. Accept appropriate alternatives if answer is correct. (1)	$R_{total}/R_t/R = 5000$ or $5k$	Correct answer (1)	2
$R_{total} = 10,000 \times 10,000 / 10,000 + 10,000$ $R_{total} = 10k \times 10k / 10k + 10k$ <p style="text-align: center;">Or</p> $1/R_{total} = 1/10,000 + 1/10,000$ $1/R_{total} = 1/10k + 1/10k$	Correct substitution of values into the formula for resistors in parallel. Accept appropriate alternatives if answer is correct. (1)					
$R_{total}/R_t/R = 5000$ or $5k$	Correct answer (1)					
Question Number	Answer	Mark				
11(e) iii	<ul style="list-style-type: none"> • Arrange resistors in series/series Needs to be named . Do NOT accept e.g. arrange resistors end to end/diagram or similar.	1				

Question Number	Answer	Mark
12	<p>Candidates may answer any specification point in either graphical form or by annotation or both, when necessary.</p> <p>No marks are awarded for the quality of graphical communication.</p> <ul style="list-style-type: none"> • have a food theme e.g. cheese wedge/food container <i>(visual – if unclear must be annotated)</i> • be easily attachable to and easily removable from most fridges e.g. hooks for shelf/Velcro/straps/suckers/clamps(if shown) (NOT magnets (unless attached to suitably identified steel component of fridge)/not adhesive materials unless used in conjunction with e.g. velcro[®]/ NOT e.g. screws into fridge wall/NOT e.g. 'sits on shelf' <i>(visual and annotated if necessary)</i> • sense when the fridge door is opened: e.g. <u>named switch or sensor</u> PTM switch/ micro-switch/ reed switch/ piezo sensor (if explained/understanding is evident)/ trembler switch/ vibration sensor/ video motion sensor/ (NOT tilt switch)/ gyroscopic sensor / accelerometer LDR/ thermistor/ IR sensor/ IR emitter and receiver/ PIR sensor/ ultrasonic system/ photocell/ phototransistor (NOT 'motion sensor' alone) <u>Information provided by candidates should be sufficient to understand operation</u> <i>(visual and annotated)</i> • have a suitable internal power source e.g. named battery type/battery technology e.g. 9v/PP3/AA/AAA/NiCd/NiMH/Li-ion/Alkaline etc../ watch/cell/rechargeable batteries (NOT e.g. direct USB/mains or e.g. solar) <i>(visual and annotated)</i> • be made from a material which can be injection moulded e.g. suitable polymer e.g. HIPS/acrylic/ABS (accept any appropriate thermoplastic/elastomer) <i>(annotated)</i> • have an audible alarm e.g. buzzer/loud speaker/siren/piezo buzzer/bell/siren <i>(visual and annotated e.g. speaker holes)</i> • have an output component to show when it is on: <u>dedicated component such as</u> light or sound or display output e.g. LED, bulb, lamp, LCD screen, buzzer, speaker, LED dot matrix display, 7 segment display <i>(visual and annotated)</i> 	

- **have a secure method of switching the alarm on and off**
e.g. key switch, keypad (for PIN), PTMs (at least 3 for PIN)
(**NOT** e.g. DPDT, rotary)
(must be tamper-proof – **NOT** just e.g. recessed)
(*visual and annotated*)

Visual: must show solutions – no annotation necessary

Annotated: Must label to identify specific component

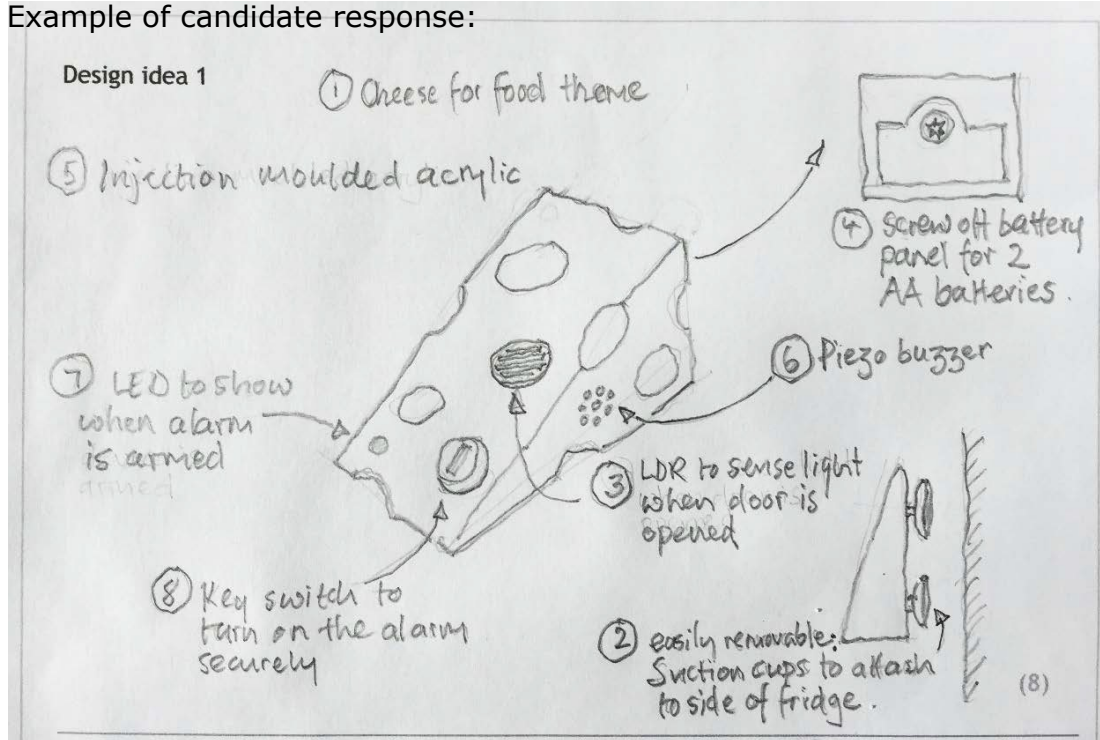
Visual and annotated: Must show solution and label to identify specific component

'Most fridges' includes those with a plastic body and plastic/glass shelves/trays

Design idea 1

8

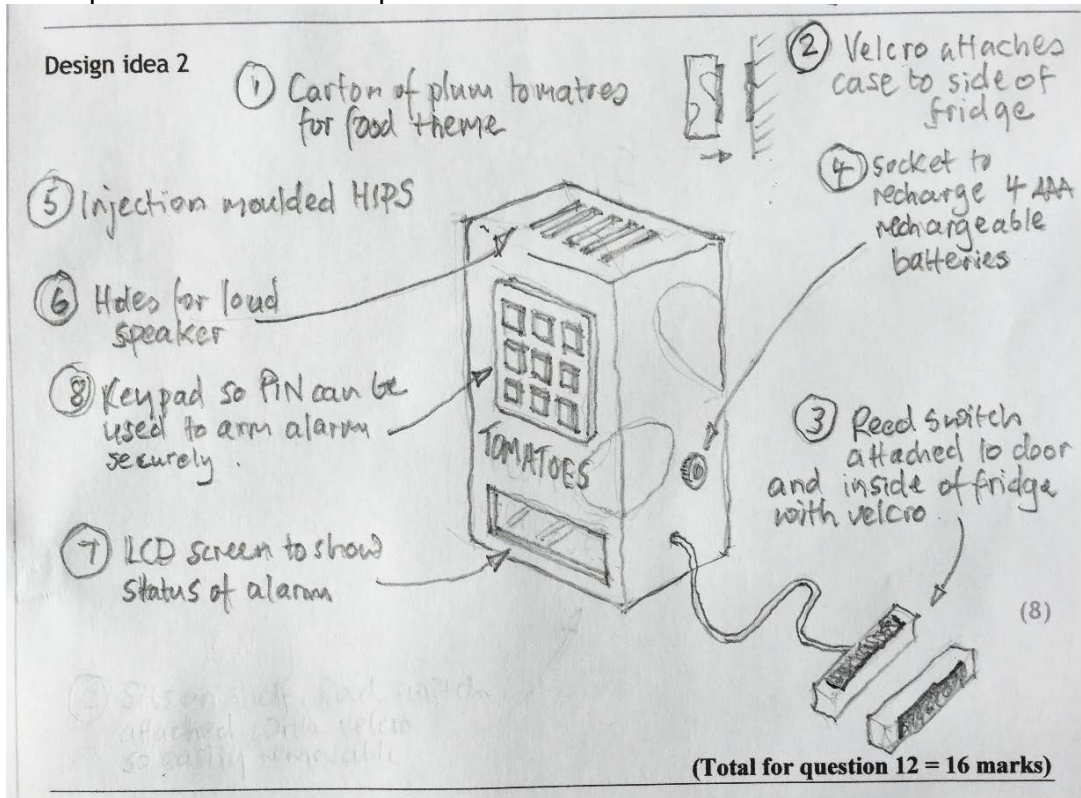
Example of candidate response:



Design idea 2

Marks for design idea 2 can only be awarded where specification points differently than in design idea 1.

Example of candidate response:



8

Question Number	Answer	Mark
13(a) i	<ul style="list-style-type: none"> • Rubber is a soft/no sharp edges material (1) so it is comfortable when moving/ so it is comfortable over time / does not cut/rub/scratch into the user's wrist (1) • Rubber is a flexible/stretchable/elastic material (1) so it allows for movement/grips wrist/always stays in place/is comfortable when moving/adjusts to any wrist shape (1) • The edges of the strap/clasp are rounded/smooth (1) so they do not cut into the user's wrist/is comfortable when moving (1) • The strap is adjustable (1) so can be changed for/fits different sized wrists/for good fit/not too tight/will not irritate/will not pinch/is comfortable when moving (1) • Rubber is relatively lightweight (1) making it comfortable when exercising (1) <p>Accept appropriate combinations. The feature/material needs to be linked with a property for the first mark e.g. 'rubber wrist band is comfortable to wear' (0 marks)</p>	2
Question Number	Answer	Mark
13(a) ii	<ul style="list-style-type: none"> • LED display emits light/is bright (1) so it can be read at night/in dark/bright light (1) • Time can be displayed as numbers/large numbers/digitally (1) which is clearer than an analogue watch/can be simpler to see when moving (1) • The display allows numbers to be made relatively large (1) so can be seen from a greater distance/ which is clearer than an analogue watch/can be simpler to see when moving (1) • Only simple information such as the time needs to be displayed on the LED dot matrix display (1) so there is no confusing information (1) <p>Accept appropriate combinations. Do NOT accept references to the properties of acrylic. Do NOT accept 'clearer'/'easier to read' in isolation without property/feature Do NOT accept 'high resolution'</p> <p>The feature/material needs to be linked with a property for the first mark e.g. 'LED screen is easy to read' (0 marks)</p>	2

Question Number	Answer	Mark
13(b)	<p>Any two from:</p> <ul style="list-style-type: none"> • Acrylic can be completely transparent/clear/see-through (1) which means the brightness of the display is not reduced/you can see the display (clearly) (1) (do NOT accept 'translucent') • Acrylic is lightweight/not as heavy compared to glass (1) so it does not add weight to product/is more ergonomic (1) • Acrylic is moisture proof/resistant (1) so product will not be damaged if exposed to liquid/protects product from liquid (1) • Acrylic can be coated to be made scratch resistant (1) so display is not obscured/wear and tear (1) • Additives can make acrylic impact resistant (1) so will withstand knocks and bumps/wear and tear (1) • Acrylic can be (injection) moulded (1) suitable for high volume/mass/batch production (1) • Acrylic is UV resistant (1) will not be degraded by sunlight (1) • Acrylic is a good insulator (1) protecting electronics from short circuits (not electric shocks) (1) • Acrylic is rigid/stiff (1) helps protect display/product (1) <p>Accept appropriate combinations. Do NOT accept repeated points or repeated expansions. Do NOT accept generic answers e.g. 'cheap', 'strong', 'hard', 'tough', 'impact-resistant', 'durable' unless justified/qualified appropriately. Do NOT accept irrelevant properties such as 'available in a range of colours'.</p>	4

Question Number	Answer	Mark
13(c)	<p>One advantage and one disadvantage from:</p> <p>Advantages:</p> <ul style="list-style-type: none"> • Once paired, connection between devices is automatic/you can pair devices (1) so you do not have to manually connect devices each time/making it simpler or quicker to connect/do not have to remember passwords (1) • The user of a device has to actively join a network (1) so you have control/it is secure (1) • Frequency hopping (spread spectrum)/switching between frequencies (1) reduces interference from other Bluetooth devices/sources (1) • World-wide/common standard (1) so all Bluetooth devices are compatible/allowing access to world/larger market (1) • Low power/tiny amount of radio power (1) ideal for battery operation/battery lasts longer/less frequent need to charge (1) • Up to 8 devices/multiple devices can connect to network (1) allowing communication with e.g. printers/other phones/smart devices/allowing data to be shared (1) • Data can be shared simply between devices (1) so you can e.g. (<u>specific, technical example required</u>) track fitness from a phone app (1) • You do not have to remove device to transfer data (1) so you do not have to stop what you are doing while data downloads (1) • Detailed information cannot be viewed easily on small displays (1) so Bluetooth[©] allows you to view information on larger displays of other devices without a physical connection (1) <p>Disadvantages:</p> <ul style="list-style-type: none"> • Short range/commonly works under 10m (1) have to be close/in same room as paired computer (1) • Hackers/other people can gain connect/control of your device / 'Bluebugging' (1) allowing access to phone features/make calls/texts/personal data (1) • The connection is not 100% secure (1) so you can lose/share sensitive data (1) • Not particularly high bandwidth (1) so cannot transmit large files/large amounts of data/data transfer can be slow (1) • The technology can be affected by interference/poor connections (1) making it difficult to view data/operate a connected device (1) • Some (older) devices are incompatible/do not have Bluetooth[©] (1) so it is impossible to connect your Bluetooth[©] device/you have to buy a newer device (1) 	4

Accept appropriate combinations.
Do **NOT** accept repeated points or repeated expansions. Do **NOT** accept e.g.

- **'uses up battery quicker'**
- **'no need for cable'** or similar although justification may be creditable
- **'fast', 'expensive', 'easy/simple to use'/'cheap' or similar**, in isolation, unless accompanied with an appropriate technical point e.g:

"Easy to use, you just have to press pairing button (1) so the connection is made automatically (1)"

Question Number	Answer	Mark
13.(d)	<p>It is important to reward the range and depth of knowledge and understanding exhibited in candidate responses. L3 answers should expand points beyond the obvious, in some detail, and display high levels of knowledge and understanding.</p> <p>The tabulated bullet points are only indicative of areas which might form a basis of discussion and do not represent an effective way of answering the question.</p>	6

	Fitness band	Fitness watch
Form	<ul style="list-style-type: none"> • Long, narrow elastic band grips around chest so it will not slip in active exercise • Adjustable strap with buckles so can be made smaller or larger for all chest sizes • Rounded HIPS component to house electronics for comfort • Logo form prominent to promote brand may not appeal to all • Larger product so more obtrusive • Form/buckles may make it more uncomfortable • Elastic loses elasticity/frays 	<ul style="list-style-type: none"> • Short narrow adjustable elastic rubber strap - one size so will fit all wrists • Flat clear acrylic screen so time can be seen clearly • Rounded moulded edges for comfort • Clean sleek design will appeal to design conscious audience • Smaller product so more convenient
	Fitness band	Fitness watch
User requirements	<p>Accept references to appropriate user expectations and comparison of e.g. functional/aesthetic features such as comfort/convenience/safety</p>	
	<ul style="list-style-type: none"> • Convenience of wireless connection to phone/computer/compatible gym equipment • Can be hidden under clothing - will not catch on e.g. sports equipment • Requires washing as sweat is absorbed • Records fitness data which can be displayed on special gym equipment but no display so could be inconvenient as user needs to connect to other equipment which might not be compatible • No controls so single function - less versatile than fitness watch - cannot use to tell time • Adjustable strap to fit any chest size • Soft elastic band provides comfort but could be uncomfortable for some people 	<ul style="list-style-type: none"> • Bluetooth® connection to phone/computer • Provides real time data all the time - no need for special equipment • More data available through Bluetooth connection • Non-absorbent material - wipe clean but rubber could feel sweaty and uncomfortable • Simple button to switch between functions • Clip on design easy to fit • Adjustable strap • Dot matrix LED display can be seen in dark and bright conditions but is limited in the detail it can communicate • Attractive textured finish to appeal to customers • Rubber strap is soft so it should be comfortable • Dual function (<u>tells the time</u>) so more convenient • Sweat collects under strap causing discomfort and irritation • Designer item appeals to fashion conscious

- L3 responses should focus arguments upon form and user requirements.
- Generalised lists may gain little or no credit.
- Bullets or tables are limited to L2 at most but only if high levels of understanding and comparative argument are evident. Most generic lists are likely to be L1 level or zero.

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-2	Candidate identifies the area(s) of comparison with no development OR identifies and develops one area. Shows limited understanding of the comparison. Writing communicates ideas using everyday language but the response lacks clarity and organisation. The candidate spells, punctuates and uses the rules of grammar with limited accuracy.
Level 2	3-4	Candidate identifies some areas of comparison with associated developments showing some understanding of the comparison. Writing communicates ideas using D&T terms accurately and showing some direction and control in the organising of material. The candidate uses some of the rules of grammar appropriately and spells and punctuates with some accuracy, although some spelling errors may still be found.
Level 3	5-6	Candidate identifies a range of areas of comparison with associated developments showing a detailed understanding of the comparison. Writing communicates ideas effectively, using a range of appropriately selected D&T terms and organising information clearly and coherently. The candidate spells, punctuates and uses the rules of grammar with considerable accuracy.

Question Number	Answer	Mark
14(a)	<p>LED lights up (1) goes off after a while/time/delay (1)</p> <p>Second mark requires reference to timing period such as 'stays on for a short time'.</p> <p>Do NOT accept e.g. description of an astable (flashing) circuit (0 marks) Do NOT accept e.g. 'comes on after a time delay' (0 marks)</p>	2
Question Number	Answer	Mark
14(b)	<p>Method 1: Double the value/size of the VR/200k resistor / Change value of VR/200k resistor to 400k / set the VR to double the value</p> <p>Method 2: Double the value/size of the capacitor / Change value of capacitor to 200µF</p> <p>Accept appropriate combinations.</p> <p>Allow 1 mark for answer which exhibits understanding that both VR resistance and capacitance need to be increased (NOT e.g. 'change/adjust' values).</p> <p>Do NOT award credit for answers which refer to 'resistor' alone/reference to PIC</p>	2
Question Number	Answer	Mark
14(c)	<ul style="list-style-type: none"> • Flexible (1) simple to switch between different products/produce customised circuits/responds quickly to design changes (1) • Consistent/reliable (1) all circuits are exactly the same/identical/fewer rejects/better levels of quality (1) • Fewer/no humans involved (1) so safe/ lower (labour) costs/ no need to heat factory/ fewer rejects (1) • Operates 24/7/does not need breaks (1) leading to lower unit costs/ higher output (1) • Automatic QC/Fewer mistakes/rejects (1) saving money/ increasing the reliability of products/ reducing need for repairs (1) • High capacity/more circuits can be produced (1) to meet demand (1) • Automatic/controlled by computers (1) so better reliability (1) • Requires less equipment/space than other methods (1) reducing accommodation costs (1) • Surface Mount Technology/SMT/smaller components can be used (1) allowing for smaller PCBs/more compact circuits/less material used (1) • Although set-up costs are high, operating costs are low (1) so the cost of producing products decreases over time (1) 	4

	<p>Accept appropriate combinations.</p> <p>Do NOT accept repeated points or repeated expansions.</p> <p>Do NOT accept reference to 'accuracy/precision' or 'speed/fast' or 'similar.'</p> <p>Do NOT accept references to the reduction in need for 'skilled labour' unless accompanied by reasonable explanation/qualification.</p> <p>Do NOT accept generic responses unless justified/qualified e.g. 'cheaper'</p>	
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Question Number	Answer	Mark																		
14(d)	<p>A correct answer without working or with unclear working - 2 marks maximum</p> <ul style="list-style-type: none"> • ECF (error carried forward) maximum of 3 marks • Accept use of standard form • If both of the unit conversions are incorrect do NOT award marks for <u>calculation</u>, <u>answer</u> or <u>unit</u> (0 marks) • Do not award credit for a correct answer if method is incorrect <table border="1" data-bbox="312 539 1315 826"> <tbody> <tr> <td></td> <td>$T = R \times C$</td> <td></td> </tr> <tr> <td></td> <td>$T = 200\text{k}\Omega \times 100\mu\text{F}$</td> <td></td> </tr> <tr> <td>Rconv.</td> <td>$R = 200,000$</td> <td>Correct conversion from $\text{k}\Omega$ to Ω (1)</td> </tr> <tr> <td>Fconv.</td> <td>$C = 0.0001$</td> <td>Correct conversion from μF to F (1)</td> </tr> <tr> <td>Calc.</td> <td>$T = 20$</td> <td>Correct calculation/answer (1)</td> </tr> <tr> <td>Unit</td> <td>$T = 20 \text{ seconds}$ or $T = 20 \text{ s}$</td> <td>Correct unit (1)</td> </tr> </tbody> </table> <p>Examples:</p> <p>$200,000 \times 0.0001 = 20 \text{ s}$ (4 marks) Rconv./Cconv./ Calc./ Unit</p> <p>$200,000 \times 0.1 = 20,000 \text{ seconds}$ (3 marks) Rconv./ Calc./ Unit</p> <p>$200,000 \times 100 = 20,000,000 \text{ s}$ (3 marks) Rconv./ Calc./ Unit</p> <p>$200,000 \times 0.000001 = 0.2 \text{ seconds}$ (3 marks) Rconv./ Calc./ Unit</p> <p>$200,000 \times 0.001 = 200 \text{ seconds}$ (3 marks) Rconv./ Calc./ Unit</p> <p>$200,000 \times 0.000001 = 0.2$ (2 marks) Rconv./ Calc.</p> <p>$200 \times 100 = 20,000 \text{ s}$ (0 marks) no correct conversion so no marks</p> <p>$200 \times 0.1 = 20 \text{ seconds}$ (0 marks) incorrect method</p> <p>$680 \times 0.0001 = 0.68 \text{ seconds}$ (2 marks) Cconv./ Unit</p>		$T = R \times C$			$T = 200\text{k}\Omega \times 100\mu\text{F}$		Rconv.	$R = 200,000$	Correct conversion from $\text{k}\Omega$ to Ω (1)	Fconv.	$C = 0.0001$	Correct conversion from μF to F (1)	Calc.	$T = 20$	Correct calculation/answer (1)	Unit	$T = 20 \text{ seconds}$ or $T = 20 \text{ s}$	Correct unit (1)	4
	$T = R \times C$																			
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Question Number	Answer	Mark
14(e) QWC	<p>It is important to reward the range and depth of knowledge and understanding exhibited in candidate responses. L3 answers should expand points beyond the obvious in some detail and display high levels of knowledge and understanding.</p> <p>The tabulated bullet points are only indicative of areas which might form a basis of discussion and should not represent an effective way of answering the question.</p> <ul style="list-style-type: none"> • No appropriate reference to either 'recover' or 'reduce' - max 4 marks. • Answers should focus upon manufacturing • Bullets or tables are limited to L2 at most but only if high levels of understanding and comparative argument are evident. Most are likely to be L1 or zero. For indicative content see table below: 	6

Recovering energy from waste outputs Reducing inputs/waste of energy/materials		
Advantages		Disadvantages
Manufacture		
Reduce	<ul style="list-style-type: none"> • Minimise power usage in production by using renewable energy resources to reduce emissions and reliance on fossil fuel sources • Reduce power usage in production by using energy efficient appliances and machinery • Reduce number of faulty products through better QC • Reduce emissions from factories by using filters • Improve insulation/glazing in buildings to reduce energy loss • Promote energy efficiency to workforce e.g. turning off machines when not in use to reduce energy loss • Use carbon off-setting to reduce impact on the environment • Reduce the size of circuit hence amount of materials used, leading to less energy used in production and reduction in use of oil • Reducing the amount of toxic materials used in products means less arriving in landfill reducing incidence of bioaccumulation in wildlife • reduce wall thickness of product cases so more can be transported at once so reducing emissions 	<ul style="list-style-type: none"> • Investment in new power technologies and machinery is expensive • Use of renewables is not always reliable • Use of carbon off-setting is controversial
Recover	<ul style="list-style-type: none"> • Recover energy by incinerating waste materials/sending them to waste-to-energy facilities • Recover e.g. heat from manufacturing processes • Use of Cogeneration/Combined Heat Power units to recover energy 	<ul style="list-style-type: none"> • Waste-to-energy facilities are expensive to construct (but so are landfill sites) • The public is unconvinced that emissions are clean and free from harmful chemicals

Level	Mark	Descriptor
	0	No rewardable material
Level 1	1-2	Candidate identifies the issues with no development OR identifies and develops one area. Shows limited understanding of the issues. Writing communicates ideas using everyday language but the response lacks clarity and organisation. The candidate spells, punctuates and uses the rules of grammar with limited accuracy.
Level 2	3-4	Candidate identifies some issues with associated developments showing some understanding of the issues. Writing communicates ideas using D&T terms accurately and showing some direction and control in the organising of material. The candidate uses some of the rules of grammar appropriately and spells and punctuates with some accuracy, although some spelling errors may still be found.
Level 3	5-6	Candidate identifies a range of issues with associated developments showing a detailed understanding of the issues. Writing communicates ideas effectively, using a range of appropriately selected D&T terms and organising information clearly and coherently. The candidate spells, punctuates and uses the rules of grammar with considerable accuracy.

