

# Mark Scheme (Results)

## Summer 2008

GCSE

### GCSE Engineering & Manufacturing (5318) Paper 5

Unit 5318/05 Electrical and Electronics, Process Control, Computers,  
Telecommunications

Section A

Question Number	Answer	Mark
1(a)	<ul style="list-style-type: none"> <li>• 13A plug (1)</li> <li>• MP3 player (1)</li> </ul> <p>If 3 boxes ticked max marks = 1 mark. If 4 boxes or more ticked no marks.</p> <p style="text-align: right;">(2x1)</p>	(2)
1(b)	<ul style="list-style-type: none"> <li>• Programmable logic controller (1)</li> <li>• Assembly robot (1)</li> </ul> <p>If 3 boxes ticked max marks = 1 mark. If 4 boxes or more ticked no marks.</p> <p style="text-align: right;">(2x1)</p>	(2)
2(a)	<ul style="list-style-type: none"> <li>• Speaker (1)</li> <li>• Loudspeaker (1)</li> </ul> <p style="text-align: right;">(1x1)</p>	(2)
	<ul style="list-style-type: none"> <li>• Light dependent resistor (1)</li> <li>• LDR (1)</li> </ul> <p><i>Do not accept 'LED' or 'resistor' on its own</i></p> <p style="text-align: right;">(1x1)</p>	
2(b)	<p>An answer that makes reference to TWO of the following points:</p> <ul style="list-style-type: none"> <li>• To make / break electrical connections (1)</li> <li>• To switch / toggle between circuits (1)</li> <li>• To switch on and off (1)</li> <li>• Allow current to flow (1)</li> </ul> <p style="text-align: right;">(2x1)</p>	(4)
	<ul style="list-style-type: none"> <li>• To store charge (1)</li> <li>• Charge up and slow release (1)</li> <li>• To create a time delay (1)</li> <li>• As part of a filter / smoothing circuit (1)</li> </ul> <p style="text-align: right;">(2x1)</p>	
Total mark		10

Question Number	Answer	Mark														
3	<p>Key terms linked to a key area</p> <table border="0"> <thead> <tr> <th>Term</th> <th>Key Area</th> </tr> </thead> <tbody> <tr> <td> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Assembly Robots</div> </td> <td> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Information &amp; Communications Technology (ICT)</div> </td> </tr> <tr> <td> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Silicon</div> </td> <td> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Control technology</div> </td> </tr> <tr> <td> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Spreadsheets</div> </td> <td> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Modern materials</div> </td> </tr> <tr> <td> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Acrylic</div> </td> <td> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Information &amp; Communications Technology (ICT)</div> </td> </tr> <tr> <td> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Programmable Logic Controllers (PLCs)</div> </td> <td> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Control technology</div> </td> </tr> <tr> <td> <div style="border: 1px solid black; padding: 5px; width: fit-content;">Word processing</div> </td> <td> <div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Information &amp; Communications Technology (ICT)</div> </td> </tr> </tbody> </table> <p>No mark for any term linked to more than one area.</p> <p style="text-align: right;">(6x1 )</p>	Term	Key Area	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Assembly Robots</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Information &amp; Communications Technology (ICT)</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Silicon</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Control technology</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Spreadsheets</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Modern materials</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Acrylic</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Information &amp; Communications Technology (ICT)</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Programmable Logic Controllers (PLCs)</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Control technology</div>	<div style="border: 1px solid black; padding: 5px; width: fit-content;">Word processing</div>	<div style="border: 1px solid black; border-radius: 50%; padding: 10px; width: fit-content; text-align: center;">Information &amp; Communications Technology (ICT)</div>	(6)
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Total mark		6														

Question Number	Answer	Mark
4(a)(i)	<ul style="list-style-type: none"> <li>• Digital camera (1)</li> <li>• Mobile phone (1)</li> <li>• DVD player (1)</li> <li>• MP3 player (1)</li> <li>• Computer / Laptop computer (1)</li> <li>• Electric Drill (1)</li> </ul> <p><i>This list is not exhaustive; accept any product that contains electrical and electronics, process control, computers, telecommunications sector, or association with the sector.</i>  <i>Accept specific product e.g. Hoover</i></p>	(1)
4(a)(ii)	<p><b>Appropriate explanation of what the product does, may include reference to features and function</b></p> <ul style="list-style-type: none"> <li>• Digital camera - takes images (1) and stores them on disc (1)</li> <li>• Mobile phone - allows communication (1) via cell network (1)</li> <li>• MP3 player - plays music (1) via downloaded files (1)</li> <li>• To process information (1) via software such as spreadsheets and databases (1)</li> <li>• To produce holes (1) by means of converting electrical energy into mechanical energy (1)</li> </ul> <p><i>If product given in 4(a)(i) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through up to one mark.</i>  <i>No answer to 4(a)(i) no marks for 4(a)(ii)</i></p>	(2)
4(b)(i)	<ul style="list-style-type: none"> <li>• production planning (1) materials - supply and control (1) processing / production (1) assembly / finishing (1) packaging / dispatch (1)</li> </ul> <p>Example: Assembly of electronic components (pick and place (1))</p> <p><i>If product given in 4(a)(i) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through.</i>  <i>No answer to 4(a)(i) no marks for 4(b)(i)</i>  <i>Accept a process that is within any of the stages (e.g. pick and place / robots assembling parts) must be appropriate to the product stated in 4(a)(i)</i></p>	(1)

Question Number	Answer	Mark
4(b)(ii)	<p>One mark for identifying advantage. One mark for why  Appropriate advantage to the manufacturer e.g.  <b>production planning, materials - supply and control, processing / production, assembly / finishing, packaging / dispatch</b>  <b>Production planning</b></p> <ul style="list-style-type: none"> <li>• speed (1) - faster than human application (1)</li> </ul> <p><b>materials - supply and control</b></p> <ul style="list-style-type: none"> <li>• cost control (1) - by less waste / faulty parts (1)</li> <li>• waste control (1) - by monitoring processes and quality control of processes (1)</li> </ul> <p><b>processing / production</b></p> <ul style="list-style-type: none"> <li>• energy conservation (1) - by control of energy into process (1)</li> <li>• waste control (1) - by monitoring processes and quality control of processes (1)</li> <li>• competitiveness (1) - faster rates of production (1)</li> <li>• product consistency (1) - by control of processes (1)</li> <li>• cost control (1) - by less waste / faulty parts (1)</li> <li>• efficiency (1) - by less waste / faulty parts (1)</li> <li>• speed (1) - faster than human application (1)</li> </ul> <p><b>assembly / finishing</b></p> <ul style="list-style-type: none"> <li>• energy conservation (1) - by control of energy into process (1)</li> <li>• waste control (1) - by monitoring processes and quality control of processes (1)</li> <li>• product consistency (1) - by control of processes (1)</li> <li>• cost control (1) - by less waste / faulty parts (1)</li> <li>• efficiency (1) - by less waste / faulty parts (1)</li> <li>• speed (1) - faster than human application (1)</li> <li>• pick and place can work 24/7 (1) so more can be manufactured without "rest" (1)</li> </ul> <p><b>packaging / dispatch</b></p> <ul style="list-style-type: none"> <li>• packaging consistency (1) - by control of processes (1)</li> <li>• cost control (1) - by less waste / faulty parts (1)</li> <li>• efficiency (1) - by less waste / faulty parts (1)</li> <li>• speed (1) - faster than human application (1)</li> <li>• energy conservation (1) - by control of energy into process (1)</li> <li>• waste control (1) - by monitoring processes and quality control of processes (1)</li> </ul> <p><i>Low response (1) or two low responses (2) or detailed response (2) If the answer in part (i) is a manufacturing stage allows follow through up to 2 marks.  No answer to 4b(i) no marks to 4b(ii)</i></p>	(2)

Question Number	Answer	Mark
4(c)(i)	<ul style="list-style-type: none"> <li>• plastics / polymer / plastic (although plastic is not technically correct accept the term 'plastic') (1)</li> <li>• composite (1)</li> <li>• metal (1)</li> <li>• solder (1)</li> <li>• copper (1)</li> <li>• ceramic (1)</li> <li>• adhesive (1)</li> <li>• other appropriate modern material - a material currently used for the given application</li> </ul> <p><i>If product given in 4(a)(i) is not from this sector but is from one of the other engineering manufacturing sectors then allow follow through.</i></p> <p><i>No answer to 4(a)(i) no marks for 4(c)(i)</i></p> <p style="text-align: right;">(1x1)</p>	(1)

Question Number	Answer	Mark
4(c)(ii)	<p>One mark for identifying improvement One mark for how</p> <ul style="list-style-type: none"> <li>• smaller size (1) - miniaturisation (1)</li> <li>• lower weight (1) - better strength to weight ratio (1)</li> <li>• better appearance (1) - smoother / brighter finishes (1)</li> <li>• extends the life-time of product (1) - better wear characteristics (1)</li> <li>• improves wear resistance (1) - harder materials / better surface finish (1)</li> <li>• reduces cost (1) - overall product easier / machine ability (1)</li> <li>• improved functional characteristics (1) - user friendly, ease of operation (1)</li> <li>• wider customer base (1) - extensive range of products in a variety of colours/textures (1)</li> <li>• minimising maintenance requirements (1) - longer service intervals (1)</li> <li>• improved production methods (1) reducing costs of end product (1)</li> <li>• meeting regulations (1) to protect consumer from potential health and safety issues (1)</li> </ul> <p><i>Any other appropriate functional / mechanical aesthetic characteristic that relates to the improvement of the product.</i></p> <p><i>Example: Allows complex shapes to be injection moulded (1) which means laptops can be moulded to aesthetic shapes (1) and material will be lighter (1)</i></p> <p><i>If answer in part 4a(i) is inappropriate but the material given in 4c(i) is appropriate allow follow through up to 2 marks. If no answer is given in part 4a(i) but the answer to part 4c(ii) relates to the material stated in part 4c(i) allow follow through up to 1 mark. If no answer or incorrect answer given in part 4c(i) no marks awarded for 4c(ii).</i></p> <p style="text-align: right;">(2x1)</p>	(2)
Total mark		9

Question Number	Answer	Mark
5(a)(i)	<ul style="list-style-type: none"> <li>• materials supply (supplier details / raising orders) (1)</li> <li>• materials control (materials location) (1)</li> <li>• stages in manufacturing (list of processes / standard times) (1)</li> <li>• process control (statistics / references to standards) (1)</li> <li>• storage (location / description) (1)</li> <li>• distribution (customer location / packaging requirements / routing information) (1)</li> <li>• stock control (location/type of stock / critical re-order levels / stock taking / EPOS) (1)</li> <li>• marketing and mailshots (customer listing / customer orders) e.g. questionnaire (1)</li> <li>• queries and searches (product / customer / cost / supplier) (1)</li> </ul> <p><i>Do not accept 'software' names</i></p> <p style="text-align: right;">(1x1)</p>	(1)
5(a)(ii)	<p>One mark for identifying the benefit, one mark for how. Two low responses - only one mark</p> <p>Must relate to example given. No answer in (i) no marks, otherwise, allow follow through to one mark.</p> <ul style="list-style-type: none"> <li>• reduced ordering times (1) - supplier identified automatically (1)</li> <li>• maintaining quality (1) - consistency (1)</li> <li>• reduced wastage (1) - correct process used (1)</li> <li>• improved efficiency (1) - faster access to knowing material location (1)</li> <li>• better process control (1) - easier access to quality standards (1)</li> <li>• reduced labour / costs (1) - less time spent searching for data (1)</li> <li>• reduced storage space (1) - less paper work (1)</li> <li>• efficient marketing (1) - mailmerge / mailshots (1)</li> <li>• identify stock levels (1) large levels of stock not needed (1)</li> </ul> <p><i>If answer in part 5(ai) is inappropriate allow follow through up to 2 marks. If no answer given in part 5(ai) allow follow though up to 1 mark.</i></p> <p style="text-align: right;">(2x1)</p>	(2)



Question Number	Answer	Mark
5(b)(i)	<p>One mark per relevant example x 2</p> <ul style="list-style-type: none"> <li>• Mobile phone / infrared / Bluetooth (1)</li> <li>• Email / messaging (1)</li> <li>• Internet / wireless / Wi-fi (1)</li> <li>• Video conferencing (1)</li> <li>• Electronic point of sale (EPOS) (1)</li> <li>• EDI (1)</li> <li>• ISDN (1)</li> <li>• Texting (1)</li> <li>• Phone (1)</li> <li>• Fax (1)</li> <li>• Walkie talkie (1)</li> <li>• Voice over internet protocol - VoIP (1)</li> </ul> <p><i>Do not accept: TV, CAD, Radio, database, spreadsheet, computer, laptop</i></p> <p style="text-align: right;">(1x1)</p>	(1)
5(b)(ii)	<p>Must relate to example given. No answer in (i) no marks, otherwise, allow follow through to one mark.</p> <ul style="list-style-type: none"> <li>• Mobile phone (1) - flexibility / roaming location (1)</li> <li>• Email (1) - immediate permanent record (1)</li> <li>• Internet (1) - immediate vast access to information (1)</li> <li>• Video conferencing (1) - no travel expenses / less time wasted in travelling (1)</li> <li>• Electronic point of sale (EPOS) (1) - faster / more accurate (1)</li> <li>• EDI (1) - immediate transfer of information / no hard copies needed / less storage space (1)</li> <li>• ISDN (1) - more data transferred in parallel (1)</li> <li>• Texting (1)- stored record of transaction (1)</li> <li>• Phone (1) - immediate two way conversation (1)</li> <li>• Walkie talkie (1) - roaming location / flexibility / cost (1)</li> <li>• Fax (1) - hard copy record (1)</li> </ul> <p><b>Other benefits may be seen in the light of:</b></p> <p><i>Speed, accuracy, JIT, information retrieval, meets consumer demands, quicker, increased sales, reduced stock levels, reduced running costs, reduced lead times, calculation of sales, stock taking quicker / easier, storage space reduced or accept any other appropriate response</i></p> <p><i>Benefits must relate to the manufacturer</i></p> <p><i>2 low responses - 1 mark.</i></p> <p style="text-align: right;">(2x1)</p>	(2)



Question Number	Answer	Mark
5(c)	<ul style="list-style-type: none"> <li>• Less returns (1) - more consistent products (1)</li> <li>• Lower purchase price (1) - increase sales (1)</li> <li>• Shorter order times (1) - greater use of appropriate software / automated orders (1)</li> <li>• Increase sales (1) - more profit (1)</li> <li>• Better reputation / customer satisfaction (1) - more reliability (1)</li> <li>• Increased profits (1) - fewer waste products / faster throughput (1)</li> <li>• Better quality products (1) - systems reject faulty products or stop them being produced (1)</li> <li>• Greater flexibility to alter product design (1) to suit user preference (1)</li> </ul> <p><i>Benefit must relate to the retailer</i>  <i>One mark for identifying the benefit, one mark for how.</i>  <i>If two low responses given - one mark e.g. cheaper and quicker - only one mark</i>  <i>Any combination of the answers above as long as appropriately linked e.g. better quality products (1) therefore more profit (1)</i></p> <p style="text-align: right;">(2x1)</p>	(2)
Total mark		8

Question Number	Answer	Mark
6	<p><b>Two different examples</b></p> <ul style="list-style-type: none"> <li>• Process control (1)</li> <li>• PLCs (1)</li> <li>• Embedded computers (1)</li> <li>• Robotics (1)</li> <li>• CIM (1)</li> <li>• CAD / CAM links (1)</li> <li>• CAM (1)</li> <li>• CIE (1)</li> <li>• Quality control (1)</li> <li>• Automation (1)</li> </ul> <p><i>Don't accept examples that are about handling data and information e.g. databases / spreadsheets , CAD, computers, CNC</i></p> <p style="text-align: right;">(1x1) (1x1)</p> <hr/> <p><b>Two different methods used</b></p> <ul style="list-style-type: none"> <li>• Cam timers (1)</li> <li>• Manual operations associated with the sector (1)</li> <li>• Manual placing (1)</li> <li>• Manual testing (1)</li> <li>• Manual recording (1)</li> <li>• Manual measurement (1)</li> <li>• Physical activity / employees (1)</li> </ul> <p><i>Must be a feasible replacement</i></p> <p>If answer in 6(a) is not appropriate allow follow through If no answer in 6a no mark for 6(b)</p> <p style="text-align: right;">(1x1) (1x1)</p>	

6 cont	<p>Explain two different benefits One mark for identifying the benefit. One mark for how</p> <p>Examples</p> <ul style="list-style-type: none"> <li>• Reduce the time (1) testing is quicker (1)</li> <li>• Reduce the money spent (1) lower stock level / JIT techniques (1)</li> <li>• Lower labour costs (1) reduction in staffing (1)</li> <li>• Increased overall productivity (1) via increased throughput (1)</li> <li>• Improve quality (1) more consistent processes (1)</li> <li>• Continuous production (1) machines work 24/7 (1)</li> </ul> <p><i>Benefits must relate to new methods and the manufacturer.</i> <i>Low response (1) or two low responses (1) or detailed response (2). Allow follow through up to one mark providing either (a) or (b) is answered for each example.</i></p>	
	(2x1) (2x1)	(8)
	Total mark	8

Question Number	Answer	Mark
7(a)	<p>One mark for identifying the benefit. One mark for how.</p> <ul style="list-style-type: none"> <li>• reduced ordering times (1) - automatic monitoring (1)</li> <li>• improve quality / accuracy (1) - control of processes (1)</li> <li>• reduced wastage (1) - optimise production methods (1)</li> <li>• improved efficiency (1) - faster / quicker throughput (1)</li> <li>• better process control (1) - in process monitoring (1)</li> <li>• reduced labour (1) - automated processes (1)</li> <li>• lower costs (1) - reduced wastage / faster / continuous production (1)</li> <li>• safer processes (1) - less manual input (1)</li> </ul> <p>Example: <i>Reliable, fast assembly of circuit boards (1) which means less rejects (1)</i>  <i>Do not accept easier without explanation</i></p> <p style="text-align: right;">(2x1)</p>	(2)
7(b)	<ul style="list-style-type: none"> <li>• More consistent products (1) - process reliability (1)</li> <li>• Lower purchase price (1) - increased efficiency/productivity (1)</li> <li>• Shorter delivery times (1) - automated systems (1)</li> <li>• Customer satisfaction (1) - availability of different products (1)</li> <li>• Quality product (1) - fit for purpose (1)</li> <li>• Product guarantee (1) - ability to design / produce products to higher standards (1)</li> <li>• Product flexibility (1) - more variation within processes (1)</li> </ul> <p><i>1 mark for benefit, 1 mark for how. Low response (1) or detailed statement (2) or two low responses (2)</i></p> <p>Example:  <i>Readily available products of good quality (1) means fewer complaints about sub-standard products (1)</i></p> <p><i>Any combination of the answers above as long as appropriately linked e.g. more consistent product (1) fit for purpose (1)</i></p> <p style="text-align: right;">(2x1)</p>	(2)
Total mark		4
Total marks for section A		45

Section B

Question Number	Answer	Mark
8(a)	<p>An answer that makes reference to three of the following points Diagrams and notes up to 3 marks</p> <ul style="list-style-type: none"> <li>• to provide heat to component to melt flux / solder (1)</li> <li>• to supply heat to a joint (1)</li> <li>• to provide heat to the component (1)</li> <li>• to provide enough heat to avoid dry joints (1)</li> <li>• permanently join components / track with solder (1)</li> <li>• different size / shape bits for easier access (1)</li> </ul> <div style="text-align: center;">  </div> <p style="text-align: right;">(3x1)</p>	(3)
8(b)	<p>An answer that makes reference to three of the following points Diagrams and notes up to 3 marks</p> <ul style="list-style-type: none"> <li>• to locate and hold the soldering iron (1)</li> <li>• to provide a safe location for the hot iron (1)</li> <li>• to keep tip away from users (1)</li> <li>• allows hands free (1)</li> <li>• it locates sponge to help clean bit (1)</li> <li>• stability improved by heavy base (1)</li> </ul> <div style="text-align: center;">  </div> <p style="text-align: right;">(3x1)</p>	(3)
Total mark		8

Question Number	Answer	Mark
9(a)(i)	<ul style="list-style-type: none"> <li>• Stage 1 - Design / product development (1)</li> <li>• Stage 4 - Material supply and control / purchasing / material supply / material control / supply of components / supply of parts (1)</li> </ul> <p><i>Do not accept development on its own for stage 1</i>  <i>Do not accept product on its own for stage 1</i>  <i>Do not accept design ideas for stage 1</i>  <i>Do not accept material on its own for stage 4</i></p> <p style="text-align: right;">(2x1)</p>	(2)
9(a)(ii)	<ul style="list-style-type: none"> <li>• Marketing (1)</li> <li>• Stage 2 / stage two (1)</li> <li>• 2 / two (1)</li> </ul> <p style="text-align: right;">(1x1)</p>	(1)

Question Number	Answer	Mark
9(b)(i)	<p>Low response (1) or three low responses (3) or up to three marks for detailed response (3)            Appropriate descriptions including three of the following points:</p> <p><u>Production</u></p> <ul style="list-style-type: none"> <li>• Use the available resources (1)</li> <li>• Materials, parts and components used (1)</li> <li>• Processes that are used (1)</li> <li>• Used of available equipment and machinery (1)</li> <li>• Following the sequence of production (1)</li> <li>• Carrying out inspection and quality control (1)</li> <li>• Complying with health and safety factors (1)</li> <li>• Bending the tubular steel into the correct shape for the holder (1)</li> <li>• Casting the base (1)</li> <li>• Injection moulding of the handle (1)</li> <li>• Drilling holes in the outer casing (1)</li> </ul> <p><i>e.g.</i>  <i>This is the stage where resources are used by operators (1) to drill the holes of the outer casing (1) and where they are checked by inspection methods (1)</i></p> <p style="text-align: right;">(3x1)</p>	(3)



Question Number	Answer	Mark
9(b)(ii)	<p>Low response (1) or three low responses (3) or up to three marks for detailed response (3)</p> <p>Appropriate descriptions including three of the following points:</p> <p><u>Assembly and finishing</u></p> <ul style="list-style-type: none"> <li>• Putting together component parts (1)</li> <li>• Cleaning parts of the soldering iron (1)</li> <li>• Painting the base (1)</li> <li>• Any assembly process (1)</li> <li>• Attaching the steel holder to the base (1)</li> <li>• Fitting the hand grip to the iron (1)</li> <li>• Attaching the circuit board to the casing (1)</li> </ul> <p><i>e.g.</i>  <i>Manufactured parts are put together (1), the product is finished to get rid of imperfections (1) and then given a protective finish such as paint on the base (1)</i></p> <p style="text-align: right;">(3x1)</p>	(3)
Total mark		9

Question Number	Answer	Mark
10(a)(i)	<p>1 mark per named material.</p> <ul style="list-style-type: none"> <li>• Polystyrene (1)</li> <li>• Polyurethane (1)</li> <li>• Nylon (1)</li> <li>• PVC (1)</li> <li>• Aluminium (1)</li> <li>• Aluminium alloy (1)</li> <li>• Stainless Steel (1)</li> <li>• Steel mild (1)</li> <li>• Painted steel (1)</li> <li>• Or similar e.g. polymer / material (1)</li> </ul> <p><i>Do not accept any generic term - 'metal / plastic'</i></p> <p style="text-align: right;">(1x1)</p>	(1)
10(a)(ii)	<p>1 mark for improvement, 1 mark for how If no answer in 10(a)(i) then no marks. Allow follow through up to 1 mark if incorrect material is given in 10(a)(i)</p> <p>Any appropriate modern material apart from polystyrene</p> <ul style="list-style-type: none"> <li>• Ease of use (1) by improved ergonomics (1)</li> <li>• Improved appearance / aesthetics (1) due to ability to produce complex shapes / colours</li> <li>• Allows injection moulding (1) to form complex shapes (1)</li> <li>• Smooth surfaces (1) make cleaning easy (1)</li> <li>• New polymer research and development (1) allow lighter weight / smaller size (1)</li> </ul> <p style="text-align: right;">(2x1)</p>	(2)

Question Number	Answer	Mark
10(b)(i)	<p>1 mark per function. Up to 2 marks</p> <ul style="list-style-type: none"> <li>• Provides effective temp control of bit (1)</li> <li>• Enables less electricity consumption therefore is more energy efficient (1)</li> <li>• Provides a safety feature by not allowing the bit to overheat (1)</li> <li>• Provides optimum temp for soldering (1)</li> <li>• Provides consistent temperature (1)</li> </ul> <p style="text-align: right;">(2x1)</p>	(2)
10(b)(ii)	<p>1 mark per feature. Up to 2 marks</p> <ul style="list-style-type: none"> <li>• Stand (1)</li> <li>• Low voltage (1)</li> <li>• Heat resistant materials (1)</li> <li>• Double insulation (1)</li> <li>• Fuses (1)</li> <li>• Extraction (1)</li> </ul> <p style="text-align: right;">(2x1)</p>	(2)

Question Number	Answer	Mark
10(c)	<p>Low response (1) or three low responses (3) or up to three marks for detailed response (3)</p> <p>Appropriate explanation including three of the following points:</p> <ul style="list-style-type: none"> <li>• Lower costs (1)</li> <li>• Availability of range of colours (1)</li> <li>• More attractive (1)</li> <li>• Improved accuracy (1)</li> <li>• Better durability / stronger material (1)</li> <li>• Smaller size / Lighter product (1)</li> <li>• Improved functionality (1)</li> <li>• More varieties available (1)</li> <li>• Better aesthetics (1)</li> </ul> <p><i>Modern materials has enabled the manufacture to sell more soldering irons as the materials used are now stronger and more durable (1) which means the soldering iron can either be lighter or smaller (1). This also means that the soldering iron will function better (1).</i></p> <p style="text-align: right;">(3x1)</p>	(3)
Total mark		10

Question Number	Answer	Mark
11(a)	<p>Must have relevant automation technology link  Low response (1) or two low responses (2) or detailed response (2)</p> <p><b>Example of automation</b></p> <ul style="list-style-type: none"> <li>• PLC (1) to control processes in production (1)</li> <li>• Automated printing (1) of manufacturer logo (1)</li> <li>• Robots (1) dealing with electronic components (1)</li> <li>• Use of conveyor systems (1) to move parts about (1)</li> <li>• Pick and Place (1) to fit electronic components to circuit board (1)</li> <li>• Embedded computers (1) to perform dedicated functions (1)</li> <li>• Remotely operated vehicles (1) moving boxed soldering irons to dispatch or storage (1)</li> </ul> <p><i>Do not accept 'CIM' or 'CNC' without links to automation</i></p> <p style="text-align: right;">(2x1) (2x1)</p>	(4)

Question Number	Answer	Mark
11(b)	<p><b>Benefits to manufacturer</b></p> <p>If answer in 11(a) is inappropriate, allow follow through up to one mark. If no answer given in part (a), no mark. 2 x 1 mark for low response or 2 x 2 marks for detailed responses.</p> <p>Must be appropriate to those described in (a) and relate to the manufacturer e.g.</p> <ul style="list-style-type: none"> <li>• Flexible production (1) leads to meeting customer requirements better (1)</li> <li>• Consistent results and quality (1) achieved through accurate use of technology (1)</li> <li>• Reduced human intervention (1) of plant means safer operation (1)</li> <li>• Accurate printing (1) better registration (1)</li> <li>• Reduced labour costs (1) as less people involved (1)</li> <li>• Safer method (1) as humans have less exposure (1)</li> <li>• Reduced customer complaints (1) as better quality product (1)</li> <li>• Control of costs (1) lower unit cost as less waste (1)</li> <li>• Retailer confidence (1) through less complaints (1)</li> <li>• Customer confidence increased (1) through more reliable systems</li> <li>• Reduced waste (1) by less mistakes being made (1)</li> <li>• Reduced energy costs (1) through increased efficiency (1)</li> <li>• Improved production rates (1) through reduced downtime (1)</li> <li>• Gives customers variation of products in a quicker time (1) faster production changeovers (1)</li> </ul> <p style="text-align: right;">(2x1) (2x1)</p>	<p style="text-align: center;">(4)</p>

Question Number	Answer	Mark
11(c)	<p><b>Benefit to consumer</b></p> <p>If answer in 11(a) is inappropriate, allow follow through up to one mark. If no answer given in part (a), no mark. 2 x 1 mark for low responses. 2 x 2 marks for detailed responses</p> <p>Must be appropriate to those described in (a) and relate to the consumer e.g.</p> <ul style="list-style-type: none"> <li>• Consistent product (1) controlled better (1)</li> <li>• Product reliability (1) more likely to be produced to specification (1)</li> <li>• Reduced time to retail / shorter delivery times (1) as manufacturer can vary product to meet demand (1)</li> <li>• Less wastage (1) as processes monitored better (1)</li> <li>• Lower prices (1) less waste / quicker production (1)</li> <li>• Better availability (1) due to faster throughput</li> <li>• Better quality (1) through improved process control (1)</li> <li>• Better value (1) because production costs are reduced (1)</li> <li>• Product guarantee (1) as confidence in process (1)</li> <li>• Customer satisfaction (1) because of consistent products</li> </ul> <p style="text-align: right;">(2x1) (2x1)</p>	<p style="text-align: center;">(4)</p>
<b>Total mark</b>		<b>12</b>

Question Number	Answer	Mark
12(a)(i)	<p>1 mark for change.</p> <ul style="list-style-type: none"> <li>• Smaller in size (1)</li> <li>• Higher level of skills / better educated less employment for unskilled (1)</li> <li>• Work patterns (1)</li> <li>• Higher pay (1)</li> </ul> <p style="text-align: right;">(1x1)</p>	(1)
12(a)(ii)	<p>Low response (1) or two low responses (2) or up to two marks for a more detailed response (2)</p> <ul style="list-style-type: none"> <li>• Smaller in size - more responsibility (1) for undertaking a variety of operations (1) / different skills required (1) which are less traditional (1)</li> <li>• Higher level of skills / better educated/less employment for unskilled - more able people required (1) with the ability to re-train often (1) / ability to cope with constant change (1) and to undertake complex work (1) / but less overall cost for company (1)</li> <li>• Work patterns - shifts often necessary (1) resulting in better paid staff (1) / often working with different people (1) hence ability to communicate vital (1)</li> </ul> <p>Up to 2 marks each response</p> <p style="text-align: right;">(2x1) (2x1)</p>	(4)
12(b)(i)	<p>1 mark for change.</p> <p>Positive answers</p> <ul style="list-style-type: none"> <li>• Increased efficiency (1)</li> <li>• Lower emissions / reduced global warming (1)</li> <li>• Increased productivity (1)</li> <li>• Less fuel used (1)</li> <li>• Reduced wastage in production (1)</li> </ul> <p>Negative answers</p> <ul style="list-style-type: none"> <li>• Greater use of machinery (1)</li> <li>• Higher emissions (1)</li> <li>• Use of finite resources to manufacture control technologies (1)</li> <li>• Greater overall volume of products generated (1)</li> </ul> <p style="text-align: right;">(1x1)</p>	(1)



Question Number	Answer	Mark
12(b)(ii)	<p>Low response (1) or two low responses (2) or up to two marks for a more detailed response (2)</p> <p><b>Positive answers</b></p> <ul style="list-style-type: none"> <li>• Increased efficiency - lower emissions: resulting in less consumption (1) and a reduction in the increase in global warming (1) / improved manufacturing control (1) meaning less waste and pollution (1)</li> <li>• Increased productivity - less fuel used: less use of fossil fuels (1) resulting in lower consumption and emissions (1) / technology that is less dependant on finite resources (1) and makes efficient use of finite resources (1) or can use sustainable alternatives (1)</li> <li>• Reduced wastage in production: less materials used in production (1) resulting in less waste thrown into landfill (1) / ability to adapt process (1) to reduce rework / waste (1)</li> </ul> <p><b>Negative answers</b></p> <ul style="list-style-type: none"> <li>• Greater use of machinery - higher emissions: resulting in greater consumption (1) and an increase in the rate of global warming (1) / issues associated with acid rain (1) and toxic gases (1)</li> <li>• Use of finite resources to manufacture control technologies: increased consumption of raw materials (1) leading to increased likelihood of overuse / lack of supply (1) / issues associated with disposal of technologies (1) and use of finite resources for disassembly (1)</li> <li>• Greater overall volume of products generated: distribution network increased (extra fuel) (1) meaning higher CO<sub>2</sub> emissions (1) / higher quality products leading to greater demand (1) and reduced product lifespan (1)</li> </ul> <p>Up to 2 marks each response</p> <p><i>If answer in 12(b)(i) is inappropriate allow follow through up to 1 mark each. If 12(b)(i) has no answer, no mark for 12(b)(ii)</i></p> <p style="text-align: right;">(2x1) (2x1)</p>	<p style="text-align: center;">(4)</p>
<b>Total mark</b>		<b>10</b>

Question Number	Answer	Mark
13(a)	<p>An explanation that makes reference to four of the following points.  Low response (1) or four low responses (4) or detailed response (up to 4)  The following could be either positive or negative influences.</p> <ul style="list-style-type: none"> <li>• Climate change (1)</li> <li>• CO<sub>2</sub> emissions (1)</li> <li>• Land fill (1)</li> <li>• Environmental contamination (1)</li> <li>• Burning fossil fuels in manufacturing processes (1)</li> <li>• Renewable energy (1)</li> <li>• Global expansion (1)</li> <li>• Lifespan of product (1)</li> <li>• Disposal of hardware e.g. computers / machinery (1)</li> <li>• Disassembly costs (1)</li> <li>• Recycling (1)</li> <li>• Polymer shredding (1)</li> <li>• Biodegradable (1)</li> </ul> <p><b>Positive example</b>  The use of biodegradable materials (1) has lessened the need for landfill (1) and reduced environmental contamination (1) which could lead to the reduction of CO<sub>2</sub> emissions (1) because of less decomposition of the product.</p> <p><b>Negative example</b>  The difficulty of the disposal of hardware /computers (1) has led to disassembly costs (1) and reduced the scope for recycling (1) because of limited lifespan of computer products (1) and increased the need for landfill (1)</p> <p>Up to 4 marks</p>	<p>(4x1)</p> <p>(4)</p>

Question Number	Answer	Mark
13(b)	<p>An explanation that makes reference to four of the following points.            Low response (1) or four low responses (4) or detailed response (up to 4)            The following could be either positive or negative influences.</p> <ul style="list-style-type: none"> <li>• Research and development time / costs (1)</li> <li>• life cycle costs (1)</li> <li>• sales / profits (1)</li> <li>• Long term savings (1)</li> <li>• Transferring technology into further new products (1)</li> <li>• Wider product range (1)</li> <li>• Risk evaluation (1)</li> <li>• Waste (1)</li> <li>• Manufacturing efficiencies (1)</li> <li>• Derivative products i.e. smaller / larger versions / faster to develop (1)</li> </ul> <p><i>The application of new materials can have a high initial development cost (1) due to the time taken in researching and testing the product(1), but can result in savings in the long term(1) due to lower product costs meaning increased sales and profits (1) which could result in increased product range (1) or transference of technology into new product ranges (1)</i></p> <p>Up to 4 marks</p> <p style="text-align: right;">(4x1)</p>	(4)
Total mark		8
Total Marks for section B		55
Total marks for paper		100