

# Mark Scheme (Results)

June 2012

GCSE Engineering/Manufacturing  
(5EM03) Paper 3F

Mechanical, Automotive

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Question	Answer	Mark
1(a)	<ul style="list-style-type: none"> <li>• Trampoline frame</li> <li>• Adjustable spanner</li> </ul> <p><i>If 3 boxes or more ticked - no marks.</i> (2 x 1)</p>	(2)
1(b)	<ul style="list-style-type: none"> <li>• Bumper</li> <li>• Dipstick</li> </ul> <p><i>If 3 boxes or more ticked - no marks.</i> (2 x 1)</p>	(2)
<b>(Total 4 marks)</b>		

Question	Answer	Mark
<b>2(a)</b>	<p>Accept any of the following answers:</p> <ul style="list-style-type: none"> <li>• Engineers' square</li> <li>• Try-square</li> <li>• Square</li> <li>• 90 degree square</li> <li>• 90° square</li> <li>• Right angle square</li> <li>• Marking out square</li> <li>• Metal square</li> </ul> <p><i>Accept any recognisable spelling (phonetic) of the answers above.</i></p> <p><i>Do not accept set square or right angle on its own.</i></p> <p style="text-align: right;">(1 x 1)</p>	
	<p><i>Accept any of the following answers recognisable spelling (phonetic) of the answer above.</i></p> <ul style="list-style-type: none"> <li>• Drill bit</li> <li>• Drill</li> <li>• Metal drill</li> <li>• HSS drill</li> <li>• Twist drill</li> <li>• Drill piece</li> </ul> <p>Accept any answer that has a reference to size/dimension in front of the word drill e.g 10mm drill, 12.2mm drill</p> <p>Do not accept 'bit' on its own.</p> <p><i>Accept any recognisable spelling (phonetic) of the answers above.</i></p> <p>(1 x 1)</p>	<b>(2)</b>
<b>2(b)</b>	<p>An answer that makes reference to TWO of the following points:</p> <ul style="list-style-type: none"> <li>• To remove material/file material</li> <li>• To improve surface finish</li> <li>• To make things square</li> <li>• To de-burr/remove sharp edges</li> <li>• To create small adjustments in size</li> </ul>	

Question	Answer	Mark
	<p>Accept any other appropriate response</p> <p>e.g. to remove material (1) to make it smoother (1)</p> <p style="text-align: right;">(2 x 1)</p>	<b>(4)</b>
	<p>An answer that makes reference to TWO of the following points:</p> <ul style="list-style-type: none"> <li>• to measure external dimensions/diameter</li> <li>• to measure internal dimensions/diameter</li> <li>• to measure accurately</li> <li>• to measure depth</li> <li>• to mark out dimensions</li> <li>• to check tolerances</li> </ul> <p>Accept any other appropriate response</p> <p>e.g. to measure an external diameter (1) accurately (1)</p> <p style="text-align: right;">(2 x 1)</p>	
<b>(Total 6 marks)</b>		

Question	Answer	Mark												
<p><b>3</b></p>	<p>Award 1 mark for each key term correctly linked to a key area.</p> <div style="text-align: center;"> <table border="0" style="width: 100%;"> <tr> <th style="width: 50%; text-align: left;">Key Term</th> <th style="width: 50%; text-align: right;">Key Area</th> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Programmable Logic Controllers (PLCs)</td> <td rowspan="3" style="text-align: right; vertical-align: middle;"> </td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Anodised Aluminium</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Databases</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Pick and place robots</td> <td rowspan="2" style="text-align: right; vertical-align: middle;">   </td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Glass Reinforced Plastic (GRP)</td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Word Processing</td> <td rowspan="2" style="text-align: right; vertical-align: middle;"> </td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;">Polypropylene</td> </tr> </table> </div> <p><i>No mark awarded where 2 or more lines are drawn from a key term. Lines do not have to be straight but key term and key area must be clearly linked.</i></p> <p style="text-align: right;">(7 x 1)</p>	Key Term	Key Area	Programmable Logic Controllers (PLCs)		Anodised Aluminium	Databases	Pick and place robots	 	Glass Reinforced Plastic (GRP)	Word Processing		Polypropylene	<p><b>(7)</b></p>
Key Term	Key Area													
Programmable Logic Controllers (PLCs)														
Anodised Aluminium														
Databases														
Pick and place robots	 													
Glass Reinforced Plastic (GRP)														
Word Processing														
Polypropylene														
<p><b>(Total 7 marks)</b></p>														
Question	Answer	Mark												

Question	Answer	Mark
<p><b>4(a)(i)</b></p>	<p>Appropriate <b>products</b> such as e.g.</p> <ul style="list-style-type: none"> <li>• twist drill set</li> <li>• bike rack for car</li> <li>• side lever grease guns</li> <li>• bench pillar drill</li> <li>• lazy tong riveter</li> <li>• hydraulic cylinder</li> <li>• foot pump</li> <li>• trolley jack</li> <li>• motorbike</li> <li>• car</li> <li>• A brand name of a specific product</li> </ul> <p><i>This list is not exhaustive, accept any product associated with the mechanical/automotive sector that contains a polymer</i></p> <p style="text-align: right;">(2 x 1)</p>	<p><b>(2)</b></p>
<p><b>4(a)(ii)</b></p>	<p>Accept any appropriate polymer suitable for the product named in Product 1.</p> <p>e.g.</p> <ul style="list-style-type: none"> <li>• Twist drills set – polystyrene – HDPE (high density polyethylene)</li> <li>• Bike rack for car – polypropylene</li> <li>• Side leaver grease guns - nylon</li> <li>• Bench pillar drill – ABS, acrylic, polycarbonate</li> <li>• Lazy tong riveter - HDPE</li> <li>• Foot pump – nylon, HDPE</li> <li>• Trolley jack – HDPE</li> <li>• Motorbike - polycarbonate</li> <li>• Cars - polystyrene</li> <li>• A brand name of a specific product</li> </ul> <p>Do not accept rubber or any other elastomer or composite. Do not accept the term thermoplastic, thermosets or plastic.</p> <p style="text-align: right;">(1 x 1)</p>	<p><b>(1)</b></p>
<p><b>(a)(iii)</b></p>	<p>One mark for identifying each reason One mark for each explanation</p> <ul style="list-style-type: none"> <li>• Better functional characteristics (1) - weight (1) / size (1) / protection (1) / rigidity (1)</li> <li>• Better mechanical characteristics (1) - strength (1) / durability (1)</li> <li>• Better aesthetic characteristics (1) - surface finish (1) / texture (1) / colour (1)/</li> </ul>	

Question	Answer	Mark
	<p>appearance (1)</p> <ul style="list-style-type: none"> <li>• Meets requirements of intended markets (1) – appeal to target audience (1)</li> <li>• Better quality standards (1) – consistency (1) / reliability (1)</li> <li>• Reduced weight (1) – better strength to weight ratio (1)</li> <li>• Reduced cost (1) – quicker / quicker to assemble (1)</li> <li>• Any other appropriate functional / mechanical / aesthetic characteristic relating to the reason (1)</li> </ul> <p>e.g. improves strength and durability of the product (1) allowing items to be made smaller (1)</p> <p>If answer in 4(a) (ii) is a general term ‘thermoset’, ‘thermoplastic’ or ‘plastic’ allow follow through up to 4 marks.</p> <p>If answer in 4 (a) (ii) is an incorrect material allow follow through up to 1 mark for each of the two answers.</p> <p>If there is no answer or the answer is a product in 4(a)(ii), no marks for 4(a)(iii).</p> <p style="text-align: center;">(2 x 1)</p> <p style="text-align: right;">(2 x 1)</p>	<b>(4)</b>
<b>4(b)(i)</b>	<ul style="list-style-type: none"> <li>• production planning (1)</li> <li>• materials supply &amp; control (1)</li> <li>• processing/production (1)</li> <li>• assembly/finishing (1)</li> <li>• packaging/dispatch (1)</li> </ul> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>
<b>4(b)(ii)</b>	<p>One mark for identifying advantage One mark for why</p> <p>Appropriate advantage to the manufacturer e.g. <b>Production planning, materials supply &amp; control, processing/production, assembly/finishing, packaging/dispatch</b></p> <p><b>production planning</b></p> <ul style="list-style-type: none"> <li>• speed (1) – faster than human application (1)</li> <li>• accuracy (1) – reliability of data (1)</li> <li>• integrates with other software systems (1) giving more accurate plan (1)</li> </ul>	



Question	Answer	Mark
	<p><b>materials supply &amp; control</b></p> <ul style="list-style-type: none"> <li>• buy best available materials (1) – use of internet (1)</li> <li>• waste control (1) – by monitoring processes and quality control of processes (1)</li> </ul> <p><b>processing/production</b></p> <p>Answer could relate to the application of CAM and control technology such as: -</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/application of CAM techniques (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> <p>Answer could relate to the application of CAM and control technology such as: -</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> </ul> <p><b>packaging/dispatch</b></p> <p>Answer could relate to the application of CAM and control technology such as: -</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>	



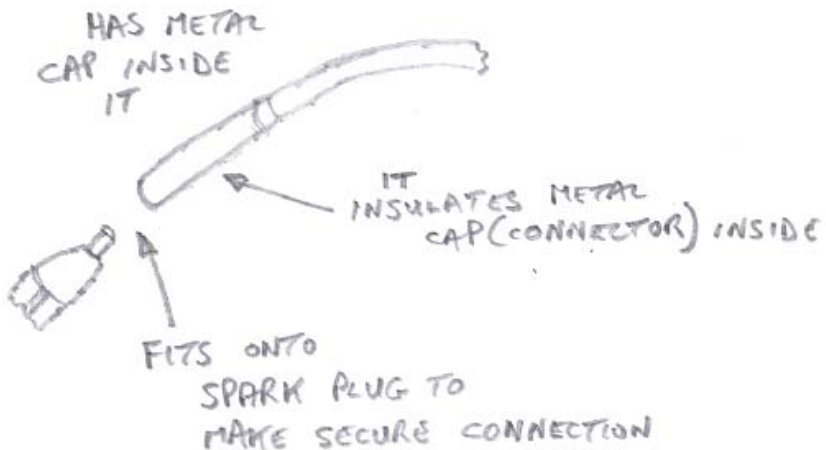
Question	Answer	Mark
<p><b>5(a)</b></p>	<p>One mark for each identification            One mark for each extension</p> <ul style="list-style-type: none"> <li>• For accurate drawings (1) – through entry of accurate data on sizes (co-ordinates) (1)</li> <li>• Quicker development time (1) – through simulation (1)</li> <li>• Easier to communicate, i.e. ICT (1) – for transfer of data (1)</li> <li>• Easy to make modifications/edit/change (1) – no paper hard copies (1)/computer data (1)</li> <li>• Lower initial development costs (1) – concurrent design processes (1)</li> <li>• Easier storage of data/information and retrieval (1) – interaction with databases (1)</li> <li>• Ability to convert from 2D to 3D (1) for modelling (1)</li> </ul> <p><i>Low response (1) or 2 low responses (1) e.g. its quicker and more accurate – only one mark or detailed response (2)</i>  <i>Do not accept 'easier' without explanation</i></p> <p style="text-align: right;">(2 x 1)            (2 x 1)            (2 x 1)</p>	<p><b>(6)</b></p>
<p><b>5(b)</b></p>	<p>One mark for reason            One mark for extension</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>• faster processes (1) – less manual input (1)</li> <li>• Safer/cleaner (1) – more suitable for</li> </ul>	

Question	Answer	Mark
	<p style="text-align: center;">hazardous environment (1)</p> <p><i>Do not accept 'easier' or 'faster' / 'quicker' without explanation.</i></p> <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>
<b>(Total 8 marks)</b>		

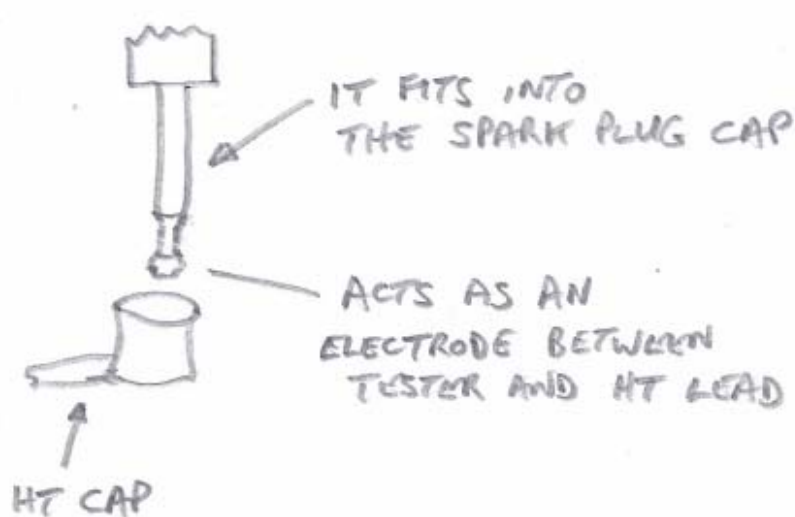
Question	Answer	Mark
<b>6(a)(i)</b>	<ul style="list-style-type: none"> <li>• a method of exchanging digital messages (1) across the Internet (1)</li> <li>• a protocol (1) for sending, receiving and storing messages (1)</li> <li>• the exchange of computer-stored messages (1) by telecommunications (1)</li> <li>• A quick method (1) which allows functions such as attachments / read receipts (1)</li> </ul> <p><i>Accept any other appropriate response Low response (1) or two low responses (2) or detailed response (2)</i></p> <p style="text-align: right;">(2 x 1) (1 x 2)</p>	<b>(2)</b>
<b>6 (a) (ii)</b>	<p>1 mark for identification 1 mark for why</p> <ul style="list-style-type: none"> <li>○ Messages go to Junk mail (1), issues with accessing the message (1)</li> <li>○ Insecure (1), loss of confidential data (1)</li> <li>○ Mail boxes can be full (1), mail not received (1)</li> <li>○ Inefficient (1) intended recipient doesn't always receive the message (1)</li> <li>○ Hard to translate (1) could receive incorrect meaning (1)</li> <li>○ Restriction on size of message (1), unable to send large files (1)</li> <li>○ Recipient doesn't always receive the message immediately (1), delay in access to computer software (1)</li> </ul> <p><i>Do not accept any answer that is not directly related to email or lower costs.</i></p> <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<b>(2)</b>

Question	Answer	Mark
	<p><i>Do not accept repetitive responses</i></p> <p>(2 x 1) (1 x 2)</p>	
<b>6(b)(i)</b>	<ul style="list-style-type: none"> <li>• Face to face meeting /meeting(1)</li> <li>• Telephone (1)</li> <li>• Conference (1)</li> </ul> <p><i>Accept any appropriate response</i></p> <p>(1 x 1)</p>	<b>(1)</b>
<b>6(b)(ii)</b>	<p>One mark for each identification One mark for each extension</p> <ul style="list-style-type: none"> <li>• convenience (1) – don't have to travel to venue (1)</li> <li>• cost savings (1) – travel costs reduced (1)</li> <li>• time savings (1) – communication in real time (1)</li> <li>• 'work environment' (1) – all material/information at hand (1)</li> <li>• access to outside experts (1) – regular meetings to compare data etc (1)</li> <li>• staff development (1) – encourages employees to keep up to date with modern technology (1)</li> <li>• Can be arranged at short notice (1) – avoids lengthy planning (1)</li> <li>• Can be recorded (1) – played back to remind/recall information (1)</li> </ul> <p><i>Accept any other appropriate response</i> <i>Low response (1) or two low responses (2) or detailed response (2)</i> <i>Do not accept repetitive responses</i></p> <p>(2 x 1) (1 x 2)</p>	<b>(4)</b>
<b>(Total 9 marks)</b>		

Question	Answer	Mark
<b>7(a)</b>	<p>One mark for benefit One mark for extension</p> <ul style="list-style-type: none"> <li>• Accurate information (1) – updated regularly (1)</li> <li>• Detailed information (1) – high storage space (1)</li> <li>• Fast access to data (1) – search/sort/query (1)</li> <li>• Improved planning (1) – short lead times (1)</li> <li>• Forecasting (1) – collects volumes of data/modelling (1)</li> <li>• Cost of control (1) – better scheduling (1)</li> <li>• Waste control (1) – process monitoring/control (1)</li> <li>• Reduced stock holding(1) – tracks trends/JIT</li> <li>• Training records (1) – skills monitoring (1)</li> <li>• Wage information (1) – ease of cost monitoring (1)</li> </ul> <p><i>Accept any other appropriate response</i></p> <p style="text-align: right;">(1 x 2)</p>	<b>(2)</b>
<b>7(b)</b>	<p>One mark for each benefit One mark for each extension</p> <ul style="list-style-type: none"> <li>• Accurate orders (1) – updated regularly (1)</li> <li>• Detailed stock movement information (1) – efficient storage space (1)</li> <li>• Fast access to data (1) – search/sort/query (1)</li> <li>• Effective goods tracking (1) – barcoding/EPOS (1)</li> <li>• Fast distribution (1) – Fast delivery details</li> <li>• Improved stock control (1) – process monitoring/control (1)</li> <li>• Regulating drivers' workload (1) – to meet delivery demand/schedules (1)</li> <li>• Improved stock security (1) – less theft (1)</li> <li>• Less stock obsolescence (1) - efficient stock turnover (1)</li> </ul> <p><i>Accept any other appropriate response</i></p> <p style="text-align: right;">(1 x 2) (1 x 2)</p>	<b>(4)</b>
<b>(Total 6 marks)</b>		

Question	Answer	Mark
<p><b>8(a)</b></p>	<ul style="list-style-type: none"> <li>• Fits over the spark plug (1)</li> <li>• Acts as a insulator (1)</li> <li>• Stops you getting a shock when in use (1)</li> <li>• Houses the contactor/connector in place (1)</li> </ul> <p>Accept any other appropriate response</p> <p><i>Must have notes and sketches</i></p>  <p><i>Max 2 marks if only notes or only sketches used</i></p>	<p>(3 x 1)</p> <p><b>(3)</b></p>
<p><b>8(b)</b></p>	<ul style="list-style-type: none"> <li>• To transfer the spark (1)</li> <li>• Connects into the spark plug cap (1)</li> <li>• Allows spark to go through the tester (1)</li> <li>• Acts as an electrode (1)</li> <li>• Fits between tester and lead (1)</li> </ul> <p>Accept any other appropriate response</p> <p><i>Must have notes and sketches</i></p>	<p><b>(3)</b></p>



Question	Answer	Mark
	 <p data-bbox="430 291 1228 806">A hand-drawn diagram showing a spark plug cap assembly. At the top is a jagged, crown-shaped cap. Below it is a vertical tube with a small gap at the bottom. To the right of this tube, an arrow points to the text "IT FITS INTO THE SPARK PLUG CAP". Below the tube is a cylindrical component labeled "HT CAP" with an arrow pointing to it. To the right of this cylinder, an arrow points to the text "ACTS AS AN ELECTRODE BETWEEN TESTER AND HT LEAD".</p> <p data-bbox="351 851 1085 896"><i>Max 2 marks if only notes or only sketches used</i></p>	

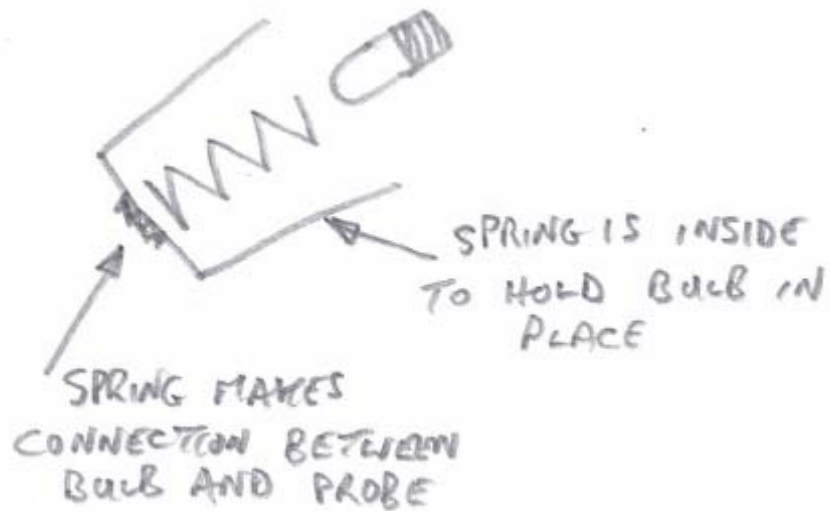
(3 x 1)

8(c)

- It makes connection between the probe (1)
- It makes connection between the bulb (1)
- Holds the bulb in place (1)
- Allows the circuit to flow through the tester (1)
- To allow easy removal of bulb (1)

Accept any other appropriate response

*Must have notes and sketches*



*Max 2 marks if only notes or only sketches used*

(3 x 1)

(3)

**(Total 9 marks)**

Question	Answer	Mark
<b>9(a)(i)1</b>	<ul style="list-style-type: none"> <li>• Production planning</li> <li>• Planning</li> <li>• Planning for production</li> </ul> <p><i>Do not accept 'production' on its own</i></p> <p style="text-align: right;">(1 x 1)</p>	
<b>9(a)(i)2</b>	<ul style="list-style-type: none"> <li>• Production and processing</li> <li>• Production</li> <li>• Processing</li> </ul> <p style="text-align: right;">(1x1)</p>	<b>(2)</b>
<b>9(a)(ii)</b>	<ul style="list-style-type: none"> <li>• Assembly &amp; finishing</li> <li>• Assembly</li> <li>• Stage 6/stage six</li> <li>• Six/6</li> </ul> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>
<b>9(b)(i)</b>	<p>Appropriate descriptions including three of the following points (statements must be applicable to the inline ignition spark tester):</p> <ul style="list-style-type: none"> <li>• Gathering consumer opinion (1)</li> <li>• Calculating products costs (1)</li> <li>• Developing market plan (1)</li> <li>• Using market research (1)</li> <li>• Developing a competitive edge (1)</li> <li>• Advertising the inline ignition spark tester (1)</li> <li>• Promoting the inline ignition spark tester (1)</li> <li>• Carrying out questionnaires/surveys (1)</li> <li>• Contributes to sales activities (1)</li> </ul> <p>e.g. The stage where the advertising (1) of inline ignition spark testers is carried out following a range of market research strategies (1) to gather consumer opinion (1).</p> <p>e.g. The stage where the manufacturer uses a range market research strategies (1) to gather people's opinions (1) to be</p>	<b>(3)</b>

Question	Answer	Mark
	<p>able to promote (1) the inline ignition spark testers.</p> <p><i>Accept any other appropriate response</i>  <i>Up to 3 marks</i>  <i>1 x 1 mark low response, 3 x 1 mark 3 low responses or up to 3 for detailed response</i>            (3 x 1)</p>	
<p><b>9(b)(ii)</b></p>	<p>Appropriate descriptions including three of the following points (statements must be applicable to the inline ignition spark tester):</p> <ul style="list-style-type: none"> <li>• Availability of suitable materials (1)</li> <li>• Purchase of suitable materials (1)</li> <li>• Sourcing of bought-in components (1)</li> <li>• Purchasing of bought-in components (1)</li> <li>• Good inwards inspection (1)</li> <li>• Storage of materials (1)</li> </ul> <p>e.g. The stage where the manufacturer would use a database (1) to source suitable materials (1) and bought-in components (1) for the inline ignition spark tester. These parts could then be purchased (1) and inspected (1) on arrival at the company.</p> <p><i>Accept any other appropriate response</i></p> <p><i>Up to 3 marks</i>  <i>1 x 1 mark low response, 3 x 1 mark 3 low responses or up to 3 for detailed response</i>            (3 x 1)</p>	<p><b>(3)</b></p>
<p><b>(Total 9 marks)</b></p>		

Question	Answer	Mark
<b>10(a)</b>	<ul style="list-style-type: none"> <li>• Mild steel</li> <li>• Steel</li> <li>• Low carbon steel</li> <li>• Aluminium</li> <li>• Aluminium alloy</li> <li>• Duralumin</li> <li>• Brass</li> </ul> <p style="text-align: right;">(1 x 1)</p>	<b>(1)</b>
<b>10(b) (i)</b>	<p>Any three of the following:</p> <ul style="list-style-type: none"> <li>• turning</li> <li>• hardening/surface hardening</li> <li>• annealing/normalising</li> <li>• polishing/coating/plating</li> <li>• cutting/shearing</li> <li>• presswork/bending</li> <li>• extrusion</li> <li>• bonding</li> <li>• soldering</li> <li>• Crimping</li> </ul> <p><i>Any other appropriate response</i>  1 mark per response up to 3  <i>Accept any recognisable spelling (phonetic)</i>  <i>of the answers above.</i></p> <p style="text-align: right;">(3x1)</p>	<b>(3)</b>

<p><b>10(b) (ii)</b></p>	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• quick method/fast production rate</li> <li>• excellent surface finish</li> <li>• no machining needed</li> <li>• any excess material can be re-used</li> <li>• unit costs are low for medium to high volume injection runs</li> <li>• highly automated process</li> <li>• reliable process</li> <li>• minimal waste</li> <li>• not labour intensive</li> <li>• can be mass produced easily</li> <li>• products have consistent quality</li> <li>• complex shape can be moulded easily</li> </ul> <p>e.g a highly automated process (1) allowing components to be mass produced easily(1) with consistent quality (1) and minimal waste (1)</p> <p><i>Accept any other appropriate response 1 x 1 mark low response, or up to 3 marks for detailed response</i></p> <p style="text-align: right;">(3 x 1) (1 x 3)</p>	<p style="text-align: right;"><b>(3)</b></p>
<p><b>10(c)</b></p>	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• Improved wear resistance/withstand corrosive environment</li> <li>• Longer lasting parts such as the probe</li> <li>• Products needed less maintenance</li> <li>• Easier manufacturing</li> <li>• Better functionality</li> <li>• More variation of products</li> <li>• Expanding markets (light engine, heavy duty engine) i.e. different size inline ignition spark testers doing similar work to older models etc</li> <li>• Smaller components</li> <li>• Lighter product/low density</li> <li>• Improved aesthetics</li> <li>• Reduced costs</li> <li>• Environmental improvements</li> </ul>	<p style="text-align: right;"><b>(3)</b></p>

	<p>e.g. Modern materials have developed and allowed manufacturers to improve product aesthetics (1) product functionality (1) and product durability (1)</p> <p><i>Accept any other appropriate response Up to 3 x 1 mark low responses or up to 3 marks for a detailed response</i></p> <p>(3 x 1) (1 x 3)</p>	
<p><b>(Total 10 marks)</b></p>		

Question	Answer	Mark
<p><b>11(a)(i)</b></p>	<p>One mark for identifying each QC procedure            One mark for each extension</p> <ul style="list-style-type: none"> <li>• Checking for physical damage on the inline ignition spark testers or packaging (1) – by visual inspection (1)</li> <li>• Packaging weight checks (1) – using packaging scales (1)</li> <li>• Packaging size checks (1) – by direct measurement or optical sensors (1)</li> <li>• Packaging security checks (1) – by optical scanning (1)</li> <li>• Checking quantities / batch size (1) – through bar coding (1)</li> <li>• Tracking of packaging (1) – by RFID (1)</li> </ul> <p><i>Do not accept repetitive responses            Must be within packaging and dispatch stage            Low response (1) or two low responses (2) or detailed response (2) per example</i></p> <p style="text-align: right;">(1x2) (1x2)</p>	<p><b>(4)</b></p>
<p><b>11(a)(ii)</b></p>	<p>One mark for identifying each automation used            One mark for each extension</p> <ul style="list-style-type: none"> <li>• PLCs (1) to control processes in packaging and dispatch (1)</li> <li>• Automated wrapping of inline ignition spark tester packaging (1)</li> <li>• Automated labelling of inline ignition spark tester packaging (1)</li> <li>• Automated coding of inline ignition spark tester (1) to allow automated order picking (1)</li> <li>• Use of conveyor systems (1) to move inline ignition spark tester from one packaging and dispatch process to the next (1)</li> <li>• Embedded computers (1) to perform dedicated functions (1)</li> <li>• Remotely operated vehicles (1)</li> </ul>	<p><b>(4)</b></p>



Question	Answer	Mark
	<p>moving inline ignition spark tester to next stage / storage / dispatch (1)</p> <ul style="list-style-type: none"> <li>• Pick and place robots (1) moving inline ignition spark testers packaging to next stage / storage / dispatch (1)</li> <li>• Automated counting/weighing (1) carton erector (1)</li> </ul> <p><i>Any other appropriate response</i>  <i>Do not accept repetitive responses</i>  <i>Do not accept 'CIM' or 'CNC' without links to automation</i>  <i>Must relate to the packaging and dispatch stage</i>  <i>Low response (1) or two low responses (2) or detailed response (2) per example</i></p> <p style="text-align: right;">(1 x 2) (1 x 2)</p>	
<b>11(b)</b>	<p>One mark for identifying advantage to the manufacturer  One mark for how</p> <p>Reduced customer complaints (1) – accurate products (1)  Control of costs (1) – cheaper product / more profit (1)  Avoids further processing of faulty product (1) – early detection of rejects (1)  Increased sales (1) – consistent product / lower prices (1)  User confidence (1) – consistent product / less returns (1)  Reduced waste (1) – control of manufacturing processes (1)  Made to same quality standard (1) – increased customer satisfaction/company reputation (1)  Reliable product (1) – monitoring standards / testing (1)  Detection of broken machinery (1) – less damaged product (1)  Increased output/productivity (1) - increased profit (1)</p> <ul style="list-style-type: none"> <li>• Less expensive to operate (1) – fewer manual checks (1)</li> </ul>	<b>(2)</b>

Question	Answer	Mark
	<i>Any other appropriate response</i> <i>Low response (1) or two low responses (2)</i> <i>or detailed</i> <i>response (2)</i>  <p style="text-align: right;">(1 x 2)</p>	
<b>(Total 10 marks)</b>		

Question	Answer	Mark
<p><b>12(a) (i)</b></p>	<p>One mark for impact, 2 marks for extension An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• Smaller in size (1)</li> <li>• Increased competition for fewer jobs(1)</li> <li>• Higher level of skills (1)</li> <li>• Work patterns – shifts (1)</li> <li>• Need to retrain(1)</li> <li>• Better educated (1)</li> <li>• Higher level of development skills required (1)</li> <li>• Less employment for unskilled (1)</li> <li>• Updating and training often required (1)</li> <li>• Team working more important(1)</li> <li>• Improved promotion prospects (1)</li> <li>• Reduced income/standard of living (1)</li> <li>• Cleaner workplace (1)</li> <li>• Safer workplace (1)</li> <li>• Less physically demanding tasks (1)</li> <li>• Job insecurity (1)</li> </ul> <p>e.g. Employees would need to retrain(1) and there would be increased competition for jobs(1) and there would be less employment opportunities for unskilled people(1)</p> <p><i>Accept any other appropriate response Up to three low responses (3), detailed response (3)</i></p> <p style="text-align: right;">(3 x 1) (1 x 3)</p>	<p><b>(3)</b></p>
<p><b>12(a) (ii)</b></p>	<p>One mark for impact, 2 marks for extension An explanation that makes reference to three of the following points:</p> <p>Positive answers</p> <ul style="list-style-type: none"> <li>• Reduced carbon emissions (1)</li> <li>• Operational efficiencies – less fossil fuels (1)</li> <li>• Reduced waste – landfill (1)</li> </ul>	<p><b>(3)</b></p>

Question	Answer	Mark
	<ul style="list-style-type: none"> <li>• Healthier local environment(1)</li> <li>• Improved quality – less waste(1)</li> </ul> <p>Negative answers</p> <ul style="list-style-type: none"> <li>• Distribution - network increased (extra fuel) (1)</li> <li>• Increased consumption of raw materials (1)</li> <li>• Over production(1)</li> <li>• Increased energy consumption(1)</li> <li>• Increased pollution (1)</li> </ul> <p><i>Accept combinations of the above that are positive or negative. e.g. Changes in the working environment could lead to reduced waste going into landfill (1) and would create a healthier local environment (1). However over production (1) could result in increased energy consumption (1)</i></p> <p><i>Up to 3 marks Accept any other appropriate response Up to three low responses (3), detailed response (3)</i></p> <p style="text-align: right;"><i>(3 x 1) (1 x 3)</i></p>	
<b>12(b)(i)</b>	<p>Any two of the following:</p> <ul style="list-style-type: none"> <li>• Analyse market research data in database (1)</li> <li>• Assists with pricing products (1)</li> <li>• Pricing products in spreadsheets (1)</li> <li>• Cost the resource requirements for inline ignition spark testers in spreadsheets (1)</li> <li>• Plan marketing campaign using DTP software (1)</li> <li>• Use of internet/website/social networking for marketing (1)</li> <li>• Use of emails for marketing purposes (1)</li> <li>• Video conferencing to discuss marketing + research proposals (1)</li> <li>• Assists with profit analysis/predictions (1)</li> <li>• Assists with 'pitching'/powerpoint</li> </ul>	<b>(2)</b>

Question	Answer	Mark
	<ul style="list-style-type: none"> <li>presentations (1)</li> <li>• Provides legal information (1)</li> </ul> <p><i>Accept any other appropriate response 1 mark per response up to 2 Do not accept generic responses with no link to marketing or a marketing context.</i></p> <p style="text-align: right;">(1 x 1) (1 x 1)</p>	
<b>12(b)(ii)</b>	<p>One mark for identifying the use One mark for how:</p> <ul style="list-style-type: none"> <li>• Electronic monitoring (1) of some assembly processes (1)</li> <li>• Use of sensors (1) to monitor assembly /finishing of inline ignition spark testers (1)</li> <li>• Use of software (1) to record, log output of inline ignition spark testers (1)</li> </ul> <p><i>Accept any other appropriate response Low response (1) or two low responses (1) or detailed response (2)</i></p> <p style="text-align: right;">(2 x 1)</p>	<b>(2)</b>
<b>12(b)(iii)</b>	<p>One mark for identifying the benefit One mark for how</p> <ul style="list-style-type: none"> <li>• Establishes a market database (1) shared with the manufacturer (1)</li> <li>• Has accurate costing information (1) shared with the manufacturer (1) / that can be manipulated easily (1)</li> <li>• Gives distributors opportunity to match the market needs (1) with production of inline ignition spark testers (1)</li> <li>• Gives distributors sales data fast (1) possibly leading increased sales/profits (1)</li> <li>• Accurate sales data (1) leads to accurate pricing (1)</li> <li>• Advertising/selling online (1) leads to wider market (1)</li> <li>• Assists with stock rotation (1) leading to less waste (1)</li> <li>• Navigation software (1) planning routes to reduce costs (1)</li> </ul>	<b>(2)</b>

Question	Answer	Mark
	<ul style="list-style-type: none"> <li>Efficient tracking/monitoring (1) leads to fewer product losses (1)</li> </ul> <p><i>Low response (1) or two low responses (1) or detailed response (2)</i> (2 x 1)</p>	
<b>(Total 12 marks)</b>		

Question	Answer	Mark
<b>13</b>	<p>An explanation that makes reference to four of the following points:</p> <ul style="list-style-type: none"> <li>Guards/sensors on machinery (1) so machinery can shut down automatically (1)</li> <li>Automated machinery (1) can operate in hazardous environments (1)</li> <li>Less human input at the production stage (1) reduces errors (1) and results in fewer accidents (1)</li> <li>Fewer problems with fatigue (1) enables continuous processing (1)</li> <li>Cleaner environment (1) air quality improved (1)</li> </ul> <p>e.g. Control technology is now used to prevent machines from starting when guards are not in place (1), and to shut down machines when something goes wrong (1), which means that accidents are less likely to happen (1) and therefore people won't get hurt (1).</p> <p><i>Accept any other appropriate response</i> <i>Up to 4 marks</i> <i>Up to 4 low responses (4) or detailed response (up to 4)</i></p> <p style="text-align: right;">(4 x 1) (1 x 4)</p>	<b>(4)</b>
<b>(Total 4 marks)</b>		

Question	Indicative Content	Mark
<p><b>14</b></p> <p><b>QWC i, ii, iii</b></p>	<p>Discussion may address the following issues:</p> <ul style="list-style-type: none"> <li>• <i>Issue - Reduce energy consumption</i> <ul style="list-style-type: none"> <li>▪ The inline ignition spark testers could be made from locally sourced materials</li> </ul> </li> <li>• <i>Development</i> <ul style="list-style-type: none"> <li>▪ Less need for transportation over long distances</li> <li>▪ Review of distribution networks and frequencies</li> </ul> </li> <li>• <i>Issue - Reduce energy consumption</i> <ul style="list-style-type: none"> <li>▪ The inline ignition spark testers could be manufactured using less / recycled materials and other materials / fittings that need less processing</li> </ul> </li> <li>• <i>Development</i> <ul style="list-style-type: none"> <li>▪ Using recycled materials reduces the need for energy intensive primary processing</li> <li>▪ The inline ignition spark testers could be made using materials that are strong enough to be assembled without extra components</li> </ul> </li> <li>• <i>Issue - Reduce energy consumption</i> <ul style="list-style-type: none"> <li>▪ Use of modern processes / machinery and equipment / technology enabling more energy efficient production</li> </ul> </li> <li>• <i>Development</i> <ul style="list-style-type: none"> <li>▪ Minimise high temperature operations</li> <li>▪ Contain heated air</li> <li>▪ Use of automation and control systems</li> <li>▪ Retrofit existing machinery rather than buy new</li> </ul> </li> <li>• <i>Issue - Reduce energy consumption</i> <ul style="list-style-type: none"> <li>▪ Use of sustainable sources of energy and producing as little waste as possible when manufacturing the inline ignition spark testers</li> </ul> </li> <li>• <i>Development</i> <ul style="list-style-type: none"> <li>▪ Generating own energy through solar / wind power</li> </ul> </li> </ul>	<p style="text-align: right;"><b>(6)</b></p>

Question	Indicative Content	Mark
	<ul style="list-style-type: none"> <li>▪ Using combined heat and power / energy recovery systems</li> <li>▪ Minimising overproduction</li> <li>▪ Lean manufacturing</li> </ul>	
<b>(Total 6 marks)</b>		

Level	Mark	Descriptor
	<b>0</b>	No material deserving of reward
<b>1</b>	<b>1-2</b>	The learner identifies at least two methods for reducing energy consumption or gives a brief description of one method. The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.
<b>2</b>	<b>3-4</b>	The learner gives a brief description of at least two methods for reducing energy consumption or a detailed description of one method. The learner uses some technological / manufacturing / environmental terms and shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy. Some spelling errors may still be found.
<b>3</b>	<b>5-6</b>	The learner gives a detailed explanation of at least two methods for reducing energy consumption. The learner uses a range of appropriate technological / manufacturing / environmental terms and shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.
<b>(Total 6 marks)</b>		
<b>Total Marks for Section B</b>		<b>60</b>
<b>Total Marks for the whole paper for Section A &amp; B</b>		<b>110</b>



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