

Manufacturing

General Certificate of Secondary Education **4880**

Unit 3: Application of Technology

Mark Scheme for June 2010

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Question			Expected Answer	Mark	Additional guidance
1	(a)		<p>Ready Meal = Food and Drink Sports Shirt = Textiles and Clothing Newsprint = Paper and Board Crane = Engineering and Fabrication</p>	[4]	
	(b)		<p>Responses MUST relate to one of the products given in part (a)</p> <p>One mark for an example of technology used in the product (3x1) One mark for a benefit of using the stated technology in the product (3x1)</p> <p><u>Ready meal</u> Refrigeration, keeps fresh <u>Sports shirt</u> Lycra/spandex, fits snugly/stretchy <u>Newsprint</u> Whiteners, improve appearance <u>Crane</u> Sensors, safer/ warns when becoming unstable Hydraulics, ease of lifting <u>Bleach</u> Plastic bottle, lighter weight/non breakable Child resistant cap, safer</p>	[6]	ECF for benefit if technology is incorrect but benefit is correctly referenced.
1	(c)		<p>One mark for each of two products from the biological and chemical sector (2x1) Any toiletries, medicines, cleaning agents, plastics etc</p>	[2]	Do not accept bleach

Question	Expected Answer	Mark	Additional guidance
2	<p>Annotate ✓ where marks are awarded. Total of 12 marks for sketches and notes showing an engineered product NOT A CAMERA. 4 marks for each of the following relating to the product shown in sketches and notes: Look for Structure and then Technologies and then Materials/Components. (not repeated from camera)</p> <p>Structure – maximum 4 One mark can be awarded for sketch showing overall structure.</p> <p>Then additional marks for each structural feature identified, one more for explaining how a structural feature meets its purpose/reflects the technology used.</p> <p>Technology – maximum 4 One mark for each named example of technology up to 4 marks. Alternatively additional mark for detail on how/why the correct technology(s) identified is used.</p> <p>Materials/components – maximum 4 One mark for each named example of a material or component up to 4 marks. Alternatively additional mark for detail on how/why the correct material/component identified is used.</p>	<p>[4]</p> <p>[4]</p> <p>[4]</p>	<p>NOTE 1: be flexible. Some items could fall into more than one category – one mark only for each point, but allocate to advantage</p> <p>Annotate with ticks to show where marks awarded and Annotate REP all points repeated from the camera example. i.e.:</p> <p>electronic flash for light/night pictures, lens, lightweight, pressed Al, case, Lithium ion battery, compartment, USB port for fast transfer of pictures, DC jack in, for battery charging, LCD colour screen to view pictures, Infra-red remote receiver. view finder Accept transfer/import of data/video/music/ring tones as expansion of 'connection to PC for the USB port' (which is a repeat and so not rewarded).</p> <p>NOTE 2: Some centres tutor candidates so many candidates responses will appear similar</p> <p>Do not reward generic materials e.g. plastic, metal but accept trade names, for example Perspex</p>

Question	Expected Answer	Mark	Additional guidance
3	<p>For each production stage selected: Stage 1 (see table below for examples) One mark for each of two correctly named tools/pieces of equipment. Two marks for describing safe working practice (2) Two marks for describing how to ensure quality (2) Stage 2 As stage 1 (2+2+2) Accept generic PPE if not in safety (1 mark only) Electrical safety in general 1 mark Visual checks (and of what)</p> <p>Assembly - Cupboard Screwdriver, tack hammer, clamps Work in well ventilated area, care when using hammer – keep from bench edge Ensure excess glue removed, check angles with try square, spirit level</p> <p>Finishing Laminator, trimmer Avoid hot surfaces and keep away from colleagues working nearby. Switch power off when clearing jams/maintaining, check thermostat operational. Care with sharp edges Keep flat till cool; avoid air bubbles by waiting between runs to warn up. Use guidelines on trimmer.</p> <p>Processing - PCB Etching tank, tongs, Avoid contact with chemicals/spills Timing set correctly, fresh solution,</p> <p>Packaging - Samosas Scales, pan liner, labeller Make sure surfaces are disinfected before start and wipe down between batches Handle with care/ stack neatly to avoid breakage</p>	<p>[6]</p> <p>[6]</p>	<p>The table is intended to support rather than restrict. Look for creditable points across the response.</p> <p>Do not accept materials, fluxes, chemicals, and finishing products.</p> <p>Accept repetition in second response if relevant to production stage</p> <p>For safety allow reference to behaviour once (1 only)</p>

Question			Expected Answer	Mark	Additional guidance
			Note: Accept Aluminium Alloy but not rubber for all questions that require a modern material		
4	(a)		One mark for an example of a product that uses a modern material to reduce its weight. (1) One mark for naming the material used. (1)	[2]	If product and material are transposed reward accordingly. If no product given do not reward material. Products can be rewarded if no material is given provided a modern material could potentially deliver that improvement..
	(b)		One mark for one example of a product that uses a modern material to make it easier to use. (1) One mark for naming the material used. (1)	[2]	
	(c)		One mark for an example of a product that uses a modern material to make it safer for the end user (1) One mark for naming the material used. (1)	[2]	
	(d)		One mark for an example of a product that uses a modern material to make it safer for the workforce making it. (1) One mark for naming the material used. (1)	[2]	

Question		Expected Answer	Mark	Additional guidance
	(e)	<p>For three marks the explanation should include reference to a product, a specific smart material (1) and its properties (1) that bring about a stated benefit (1)</p> <p>Nitinol shape memory alloy wire conducts electricity and also shrinks back to size when a specific temperature is reached so it can cut off the power to a kettle immediately when it boils.</p> <p>A DVD drive uses smart grease to make the tray slide in smoothly. Smart grease gets thicker when pressure is applied so it resists a larger pushing force more than a gentle one.</p> <p>Racing Bicycle uses carbon fibre to give the same strength with lighter weight frame.</p> <p>Lighter weight same strength</p> <p>A forehead thermometer/ bathwater temp indicator uses liquid crystals enclosed in a tough plastic film. This indicates the temperature without using poisonous mercury/ child unfriendly electronic devices/moving parts.</p>	[3]	
	(f)	<p>Three marks for a clear explanation of how reducing the weight of a product has affected its impact on the environment.</p> <p>For example: three marks for a link between reducing product weight and environmental impact with an example of a product.</p> <p>‘Specific car model now weighs less which reduces its fuel consumption and therefore emissions’</p> <p>Carbon fibre used in racing cars is more difficult to reuse/recycle than aluminium alloy.</p>	[3]	<p>Two for limited response For example: ‘lighter products need less fuel to deliver them’</p> <p>One for simple statement/single word, for example: ‘You can get more on a lorry;’ saves fuel’</p>

Question			Expected Answer	Mark	Additional guidance
5	a	(i)	Two marks for each of two benefits of CAD (accept generic), for example: Drawings can be easily modified Files can be exported to a CAM system saving storage space for files files can be shared with third parties (2+2)	[4]	Not faster or more accurate.
		(ii)	Two marks for a benefit specific to the end user, for example Efficient designs reduce cost/improve performance Safer products – tested for strength etc by program Customised products available at reasonable cost Improved products on sale quicker	[2]	One mark for reference to quality.
	(b)		Two marks for each of two examples of communications technology use by manufacturing companies (technology and purpose) For example use of email to send CAD files between designers Fax signed contracts Mobile phones for sales force to stay in touch with office (2 + 2)	[4]	No repetition
	(c)		Two marks for each of two examples of benefits of teamwork to large manufacturing companies (feature and benefit) For example shared goals across different company sites Team members feel they belong despite size of organisation Employees support each other to meet targets. (2 + 2)	[4]	Feature and benefit both required for 2 marks

Question			Expected Answer	Mark	Additional guidance
6	(a)		Three marks for a clear explanation of how control technology contributes to each advantage stated Ideally: making a relevant point, evidence/example and relating to the advantage.		Example required for full marks
		(i)	Improved reproducibility Once programmed, robots repeat the same actions. Human performance tends to vary through tiredness/distractions. Robots can monitor and adjust themselves (as wear occurs for example), or monitor process and adjust their settings to maintain quality.	[3]	Needs reference to programming for full marks
		(ii)	Increased rate of production Because robots can operate for expended periods without stopping... Robots can often carry out varied sequences of operations faster than humans, and faster than automated machinery needing components to be transported between operations.	[3]	Reduced start up time award one mark,
		(iii)	reduced waste Because there are fewer rejects due to improved accuracy and consistency, materials are not wasted.	[3]	
	(b)		Three marks for a clear explanation why robotics not used. Point, evidence/example, logical link. For example There are some tasks that are not suited to robotics, where space is limited such as in populating PCB's some components must be manually inserted. For simple repeated tasks such as bottling water, an automated production line gives all the above benefits. It does not need the flexibility of robotic equipment.	[3]	Not simple 'cost', justification is needed.

Question			Expected Answer	Mark	Additional guidance
7			<p>Three marks for each explanation. One mark for product. Expected response will use product as example (1) to support explanation (reasons, link to benefits)</p> <p>Manual: Wedding cake (1) Unique /special product required. Ordered well in advance, so there is time to correct errors or to make sure it is high standard (3)</p> <p>Semi automated: PC power supplies (1) Some larger/less often used components are manually inserted because don't want to buy in specialist equipment if not used every day. Batch size doesn't justify outlay/ full automation not possible. (3)</p> <p>Fully automated: Daily Newspaper (1) Large numbers of identical products are required in a short time. Quick change over achievable. Automatic adjustment. The same process is required for every print run (3)</p>	[12]	

Question		Expected Answer	Mark	Additional guidance
8	a	<p>The impact of automated production on manufactured product quality</p> <p>Six marks for discussion following the guidance, ie:</p> <p>One mark for each of 3 relevant issues (to product quality or automated production) (3)</p> <p>Two marks for explaining each of two of the issues (why relevant) (2)</p> <p>One mark for a specific supporting example (must link both aspects) (1)</p> <p>Or</p> <p>Similar breadth and depth of response</p> <p>Expected responses will focus on how automation gives consistency/accuracy so as long as machines are set up precisely, all products will be within tolerance/tolerances can be tighter (improving average quality or overall quality).</p>	[6]	<p>While relevant points may relate to either product quality or automated production, the explanation must draw both together.</p> <p>Accept points on automated checking of equipment, products, materials etc.</p>
	b	<p>Six marks for discussion following the guidance, ie:</p> <p>One mark for each of 3 relevant issues (3)</p> <p>Two marks for explaining each of two of the issues (why relevant) (2)</p> <p>One mark for a specific supporting example (must link both aspects) (1)</p> <p>Or</p> <p>Similar breadth and depth of response</p> <p>Expected responses will focus on the cost of equipment and setting up against potential future increase in profits through reduced numbers of rejected/returned/faulty products or premium quality of products.</p>	[6]	<p>While relevant points may relate to finance, introducing technology or quality, the explanation must draw both together.</p>

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