

**Applied Engineering (Double Award)
Applied Manufacturing (Double Award)**

General Certificate of Secondary Education **GCSE 1492**

General Certificate of Secondary Education **GCSE 1496**

Mark Schemes for the Units

June 2008

1492/1496/MS/R/08

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4868 Application of Technology

Question		Possible Answers	Mark	Additional Information																		
1	(a)	1 mark for each correct link.	[5]																			
				Wide bodied jet --- aeronautical Submarine ---- Marine Lawnmower --- Mechanical Memory stick --- Computer Television --- Electrical and electronic																		
	(b)	<p>One mark for each correct cell Acceptable examples (not exhaustive)</p> <table border="1"> <thead> <tr> <th>Product</th> <th></th> <th>Benefits</th> </tr> </thead> <tbody> <tr> <td>Wide bodied jet</td> <td>Aluminium alloy Auto pilot Fly by wire</td> <td>Accurate positioning Lightweight or strength/weight ratio</td> </tr> <tr> <td>Submarine</td> <td>Sonar, GPS Auto navigation</td> <td>Accurate positioning</td> </tr> <tr> <td>Lawnmower</td> <td></td> <td></td> </tr> <tr> <td>Memory stick</td> <td>Flash memory USB port</td> <td>Stable/robust fast transfer Connect to PC</td> </tr> <tr> <td>Television</td> <td>Plasma/LCD screen OLED</td> <td>Less bulky, large screen</td> </tr> </tbody> </table>	Product		Benefits	Wide bodied jet	Aluminium alloy Auto pilot Fly by wire	Accurate positioning Lightweight or strength/weight ratio	Submarine	Sonar, GPS Auto navigation	Accurate positioning	Lawnmower			Memory stick	Flash memory USB port	Stable/robust fast transfer Connect to PC	Television	Plasma/LCD screen OLED	Less bulky, large screen	[6 x1]	<p>The technology must be used by the product, not in production, but don't penalise twice (ie if benefit is appropriate to that given, award mark)</p> <p>OLED is correct (Organic LED) Accept miss-spelling – does the candidate have some “idea” e.g. product = aeronautical</p>
Product		Benefits																				
Wide bodied jet	Aluminium alloy Auto pilot Fly by wire	Accurate positioning Lightweight or strength/weight ratio																				
Submarine	Sonar, GPS Auto navigation	Accurate positioning																				
Lawnmower																						
Memory stick	Flash memory USB port	Stable/robust fast transfer Connect to PC																				
Television	Plasma/LCD screen OLED	Less bulky, large screen																				
	(c)	1 mark for one from list below only Automotive, civil, construction, fluid, telecommunications	[1]	Accept miss-spelling – does the candidate have some “idea” of the sector																		
Total maximum mark for this question is: [12]																						

Question		Possible Answers	Mark	Additional Information
2		<p>For this question reward with a tick (✓) for each correct point</p> <p>Must relate to product shown</p> <p>1 mark for each feature shown:</p> <p>Look for Structure and then Technologies and then Materials/Components.</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</p> <p>Accept transfer/import of data/video/music/ring tones, 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>SUGGESTION: find 4 structural points, then 4 examples of technology, then the materials/components from what's left.</p> <p>Stop annotating/markng this question at 4 correct examples in each category i.e. 12 marks in total.</p> <p>Do not reward unqualified generic materials e.g. plastic, metal but accept trade names for example Perspex</p>
Maximum Total Mark is 12				

Question			Possible Answers	Mark	Additional Information
			Types of Engineering Drawing		
3	(a)	(i)	One mark for each of 2 drawing types identified from: Orthographic (projection), isometric (projection), oblique (projection), block diagram, flow diagram, circuit diagram, schematic, assembly diagram, exploded diagram. perspective,	[2 x 1]	Accept exploded, first angle projection, third angle projection
			Saving		
		(ii)	Two marks for a clear benefit identified Can re-load so don't have to redraw to amend/develop etc Portable if saved to memory stick/pen drive/floppy etc Can be emailed/compressed and emailed etc Takes up less storage room than hard copy In case original file is damaged/corrupted Easily accessed by others on the network Collaboration facilitated	[2]	Must be benefit of saving CAD file on computer One mark only for single word/phrase or vague but on right track answer Eg (1 mark only) Saves paper Don't lose work In case of fire etc.
			Producing		
		(iii)	Two marks for a clear benefit identified As above if not repeated Libraries of standard parts etc available - saves drawing Can explore different options Can model on screen (view in 3d to see all angles)	[2]	Must be a benefit of using CAD to produce drawings One mark only for single word/phrase or vague but on right track answer Eg (1 mark only) Saves time editing drawing Saves paper Cheaper More professional/neater 'can see what it will look like' NOT more accurate

Question		Possible Answers			Mark	Additional Information
(b)		One mark for each cell correctly completed.				<p>Accept proprietary software, but not as a repeat of the generic name.</p> <p>Evaluating could include internet searching to compare with other products.</p> <p>This could refer to aspects of their coursework or in an industrial application</p> <p>Do not reward repeat applications but if two different activities given they can both be rewarded.</p>
		Design task	ICT application	Activity carried out		
		Contact material supplier	Email package/word processor	Ask companies for a catalogue/about products		
		Evaluating design ideas	Word processor Spreadsheet database Presentation package	Make a questionnaire/ Add up results of Q Analyse client feedback Make charts Show ideas to client		
		Show designs to a client	Presentation package Desktop publishing package	Project onto screen/ Slideshow with a talk put together drawings and notes.		
[6 x 1]					Total maximum mark for this question is: 12	

Question		Possible Answers	Mark	Additional Information
4		In each part: one mark for a suitable product and one for appropriate technology (or modern material including aluminium alloy, stainless steel where appropriate)		One mark only if the technology and product do not match, ie if tech. is not used in the given product or tech. is known to have the required effect, but not in the product).
	(a)	Racing car/golf club/bike frame – carbon fibre Surfboard/packaging/ – expanded polystyrene foam	[2 x 1]	Accept honeycomb structure
	(b)	Computer – wireless network/touchscreen/GUI... Car – power steering/SatNav... Flip top lids – polypropylene	[2 x 1]	Accept software as a technology not ergonomics (science not a technology) not lighter unless manoeuvrability important.
	(c)	Car – roll bars/crumple zones/airbags/inertia reel seat belts.. Hot air paint stripper – auto cut out when overheats Mobile phone – hands free kits/locking/passcodes	[2 x 1]	Direct safety Or indirect as in reducing the likelihood of being a victim of crime. Not simply seat belts (must be qualified)
	(d)	Carrier bag – biodegradable plastics Prius car – electric operation Car – engine management system/catalytic converter/green diesel/petrol	[2 x 1]	(also accept weight reduction measures in vehicles etc) Accept noise reduction eg Mobile phone – development of silent mode/vibrating alerts Accept recycling as a technology
	(e)	One mark for making a relevant point: The workforce will need to be trained The company will need to buy new equipment/modify designs/stop production during changeover.	[2 x 1]	Not single word like cost or training NB redundancy only if disadvantage to company is clear. Eg pay offs, social conscience, reputation

Question		Possible Answers	Mark	Additional Information
(f)		<p>Benefits to society could include improved public safety, improved public health, improved transport systems</p> <p>Eg: Water filtration systems provide clean drinking water in remote areas/portable/solar powered</p> <p>Medical diagnostic equipment (ultrasound/CAT/PET/MRI scans, X rays) detect illness early improving outcomes/monitor progress</p> <p>Medicines – eradication of some disease, improved life exp</p> <p>Surveillance cameras: help crime detection can be triggered by movement saves energy use</p> <p>Traffic signs: can respond to traffic density/speed making roads safer.</p> <p>Mobile Phone: can call emergency services promptly preventing crime/SMS – unobtrusive communication, reassures parents.</p>	[2 x 2]	<p>No marks for giving a product, but both responses should relate to the product stated.</p> <p>One mark for making a point</p> <p>Further mark for giving how/why a benefit to society or comparison.</p> <p>May be 2 benefits of the same technology or two different technologies.</p> <p>Environmental improvements: accept one only for one mark, for the second it needs to be clear how society benefits.</p>
				Maximum Total Mark is 14

Question		Possible Answers				Mark	Additional Information
5	(a)	One mark for each correct entry in the table Benefit must relate to product stated Example shown				[9]	<p>No mark for the material given.</p> <p>Not does not scratch for stainless steel: Note it scratches very easily</p> <p>If a "property" is given and is beneficial reward positively such as "rustproof"..</p> <p>If material in product "box" reward if correct</p>
		Chosen material	[✓] Class	Product	Benefits		
		Brick	Ceramic	Chimney house	Good compression strength		
		Concrete	Composite	Road bridge	Can be mixed/moulded on site		
		Duralumin	Alloy	Aeroplane	Strong and lightweight		
		GRP	Composite	Body panels for high performance vehicles window	Light/great strength		
		Stainless steel	Alloy	Cutlery	Resists corrosion so appearance/hygiene maintained		
		Tungsten carbide	Ceramic	Machine tool inserts	Hard/wear resistant withstands high temps		

Question		Possible Answers	Mark	Additional Information
	(b)	1 mark for a material correctly identified from each material group.		The materials must be different from those listed in the stem of the question i.e. NOT: Brick Concrete Duralumin Glass reinforced plastic (Fibre glass) Phosphor bronze Stainless steel Tungsten carbide
	(i)	Alloy: brass, bronze, pewter, cupro nickel, sterling silver		
	(ii)	Ceramic: boron carbide, boron nitride, silicon carbide, alumina, zinc oxide, zirconium/zirconia		Accept china clay, porcelain, clay. China
	(iii)	Composite: manufactured boards, laminates, foams – specifically named , carbon fibre	[3]	
	(c)	Global environment guide: reduce, reuse, recycle 2 marks for a clear appropriate description 1 mark for vague/unclear ('less energy used') or local environment benefit given (noise/dust reduction) Eg reduction of energy consumption when weight of vehicles/planes reduced Stainless steel - long life of products/Tungsten carbide - hard wearing, both save resources in making replacements Brick - can be re-used	[2]	Reward materials from list in table part (a) or materials from the question stem
				Total maximum mark for this question is: 14

Question		Possible Answers			Mark	Additional Information	
6	(a)	One mark for each correct cell in table. Examples			[6]	Must make sense when followed horizontally. No repeats (of welder from example or points made in the question)	
		Product	Robotic task	Type of end effector			
		Motor vehicle	Windscreen installation	Vacuum grip			
		Computer motherboard	Paint spraying	Spray gun /sprayer/nozzle			
			Populating the pcb	Autofed gun			
			Packaging	Pneumatic grip			
	(b)	(i)	One mark for each of 2 appropriate uses in production Eg controlling conveyors, controlling temperatures for heat treatment, timing a sequence of processes, etc. Or generic such as 'repetitive tasks', 'checking/monitoring production'.			[2 x 1]	
		(ii)	Two marks for each of 2 advantages over general purpose computer control clearly described.. Eg The program can control complex sequencing/PLC can handle multiple inputs and outputs at the same time. Unlike general-purpose computers, the PLC is designed for (any of the following): <ul style="list-style-type: none"> extended temperature ranges dirty or dusty conditions immunity to electrical noise resistant to vibration/impact PLC is mechanically more rugged. PLC battery powered so OK if power cut. Modular design makes replacement straightforward when faulty. The program is stored in battery-backed memory and/or EEPROMs/so don't need to reload after power cut.			[2 x 2]	One mark for simple unqualified statement of benefit. eg more flexible more robust longer life compact size (loaf of bread) modular No marks if benefit given which is not a specific advantage over general purpose computer Eg PLC can carry out repetitive operations Can be used in hazardous environments Consistency of output Need smaller workforce Can be programmed

Maximum Total Mark is 12

Question		Possible Answers	Mark	Additional Information
		CIE means...		
7	(a)	<p>0-4 marks but link has to be one of the points to gain the 4th mark.</p> <p>Computer Integrated Engineering systems use ICT to:</p> <p>link (1) Has to be clearly explained not implied manage/control (1) all of the processes (1) from design to dispatch (1) one set of computer files (1).</p>	[4]	<p>Details of processes from design to dispatch':</p> <ul style="list-style-type: none"> • <i>design,</i> • <i>marketing,</i> • <i>production planning,</i> • <i>material supply and control,</i> • <i>processing-production,</i> • <i>assembly and finishing,</i> • <i>packaging and dispatch</i> <p>One mark for link between CAD CAM maximum</p>
		CIE = quality?		
	(b)	In each part (I and ii), two marks for clear description, one for simple statement.		
	(i)	<p>Two marks for clear description:</p> <p>Improve product quality because there are no errors in transferring design information to production.</p> <p>Integrated checks reduce risk of inferior materials and components entering production.</p> <p>Monitoring/resetting machines as needed means production quality is maintained.</p> <p>Errors identified are corrected automatically</p>	[2]	<p>One mark only for simple statement / benefit for example:</p> <p>Generic CAM More accurate/less errors Consistent product Quality control</p> <p>No marks for "better designs" or 'computers are better than people' style responses.</p>

Question			Possible Answers	Mark	Additional Information
			Planning		
		(ii)	<p>Two marks for clear description. Eg Use materials/people/machinery more efficiently because production planning informed by current information about performance, so need less 'slack' in system. supports JIT – more efficient stocking computer calculates most efficient sequence of operations and monitors and modifies it to keep efficient . Barcoding of products/batches allows order tracking throughout the production process. Less machine downtime because all machines are monitored and maintenance is planned at the same time for minimum disruption to schedule.</p>	[2]	<p>Need to demonstrate understanding of production planning and link to features of CIM for 2 marks.</p> <p>Award one mark for either of the above</p> <p>Place ticks were appropriate to show how marks awarded</p>
			Reduction of waste		
		(iii)	<p>Two marks for clear description Monitoring machines means that they are taken off production before off-spec products are made Correct quantities of correct components are ordered to be delivered on time</p>	[2]	<p>One mark only for generic:</p> <ul style="list-style-type: none"> • machines don't make mistakes • materials ordered in precise quantities • efficient use of materials • fewer rejects <p>For 2nd mark "how" it is achieved is needed</p>
			Lead time		
		(iv)	<p>One mark for each appropriate reason stated. To maintain a competitive edge in the marketplace. To reduce development cost Start making profit sooner Money coming in from sales sooner</p>	[2 x 1]	<p>Do not accept points in the question stem: "shorter time taken to get a new product onto the market..."</p> <p>Accept one 'to keep customers happy' type response if related to benefit to manufacturer.</p>
Total maximum mark for this question is: 12					

Question	Possible Answers			Mark	Additional Information	
8	Annotation with ticks: 3 relevant issues, 2 why relevant, 1 example or evidence to support answer.					
(a)			Impact of control technology on production safety			<p>Or a well reasoned discussion</p> <p>One mark for a generic statement reference “control” and safety e.g. ‘makes production processes less dangerous’</p> <p>Include one reference to unsupervised equipment as a potential hazard, but not ‘if they go wrong’</p> <p>Do not reward repeated points</p> <p>Examples need a context and so cannot be rewarded as a stand alone “example”</p>
			Issues	Relevance	Examples	
			Automated cut outs	Protection of people from hazards	machine won't work without guard in place	
			Robots are an example of control technology	They can replace humans in hazardous environments	Such as paint spray booths	
			Can monitor machines/equipment	Can isolate/take out of service/warn before danger point reached	Temperature of furnace doors	
			Less human decision-making and intervention	Less danger from human error/Workers less stressed – less likely to have accidents	Laser beams trip activate to turn machine off. To prevent workers from injury	
					[6]	

Question		Possible Answers			Mark	Additional Information
(b)		Impact of ICT on range of products available				<p>Points MUST relate to the range of products available, either wider range of features or additional products made possible.</p> <p>One mark ONLY for showing understanding of the meaning of “range” of products but not mentioning ICT.</p> <p>Do not reward repeated points</p> <p>Reference to CAD CAM not to be rewarded unless “range” or “change” considered</p>
		Issues	Relevance	Examples		
		Products may contain microprocessors	That can be programmed to offer a wide range of features	digital cameras: have different programs installed for each model (editing), but are physically almost identical		
		Can order products via www	Products that are not on sale in UK or locally can be bought from other countries / sources Internet widens choice and availability	new games console/etc		
		ICT is used in CAD	Creating designs which can readily/economically be developed/customised /updated Giving a wider range	Files sent abroad to access differing manufacturing capability thus extending range		
CAD allows designs to be developed quickly/readily	Can respond quickly to results of market research/customer feedback Can expand into new markets rapidly With CAM prototyping and customised manufacture	make LHD cars for UK Nike customised sports shoes				

Question			Possible Answers			Mark	Additional Information
			Data from research/customer feedback customer requirements can be analysed using ICT	Individual products possible with ease	The mini is now totally customised by the use of ICT	[6]	
Total maximum mark for this question is: 12							

4880 Application of Technology

Question	Possible Answers	Mark	Additional Information																			
1 (a)	1 mark for each correct link.																					
	<table border="1"> <thead> <tr> <th>PRODUCT</th> <th>MANUFACTURING SECTORS</th> </tr> </thead> <tbody> <tr> <td>Bus shelter</td> <td>Biological and chemical</td> </tr> <tr> <td>Denim jeans</td> <td>Food and drink</td> </tr> <tr> <td>Washing powder</td> <td>Paper and board</td> </tr> <tr> <td>Box of tissues</td> <td>Engineering fabrication</td> </tr> <tr> <td>Frozen pizza</td> <td>Textiles and clothing</td> </tr> </tbody> </table>	PRODUCT	MANUFACTURING SECTORS	Bus shelter	Biological and chemical	Denim jeans	Food and drink	Washing powder	Paper and board	Box of tissues	Engineering fabrication	Frozen pizza	Textiles and clothing	[4]	<p>Denim jeans --- Textiles and clothing Washing powder --- Biological and chemical Box of tissues --- Paper and board Frozen pizza --- Food and drink</p>							
PRODUCT	MANUFACTURING SECTORS																					
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Frozen pizza	Textiles and clothing																					
(b)	<p>One mark for each cell completed appropriately.</p> <p>Examples (not exhaustive):</p> <table border="1"> <thead> <tr> <th>Product</th> <th>Technology used</th> <th>Benefits</th> </tr> </thead> <tbody> <tr> <td>Denim jeans</td> <td>Lycra mix</td> <td>Maintain shape</td> </tr> <tr> <td rowspan="2">Washing powder</td> <td>Optical brighteners</td> <td>Whiter whites</td> </tr> <tr> <td>Enzymes</td> <td>Works at lower temps</td> </tr> <tr> <td rowspan="2">Box of tissues</td> <td>Synthetic detergent</td> <td>No soap residue</td> </tr> <tr> <td>Microencapsulated menthol/scent</td> <td>Fresh when used/ released as needed</td> </tr> <tr> <td>Frozen pizza</td> <td>Modified starch added to cheese</td> <td>Stops running in oven</td> </tr> </tbody> </table>	Product	Technology used	Benefits	Denim jeans	Lycra mix	Maintain shape	Washing powder	Optical brighteners	Whiter whites	Enzymes	Works at lower temps	Box of tissues	Synthetic detergent	No soap residue	Microencapsulated menthol/scent	Fresh when used/ released as needed	Frozen pizza	Modified starch added to cheese	Stops running in oven	[6]	<p>The technology must be used in the product, not in production, but don't penalise twice.</p> <p>If benefit is appropriate to an incorrect technology given, award mark <i>Be positive</i>.</p> <p>Jeans: Laser cutting (0) cut many out at Once(1) Tissues: recycling(0) saves raw materials(1)</p> <p>Machine stitching is valid (stitching is in the product: industrial sewing machine is not in the product)</p>
Product	Technology used	Benefits																				
Denim jeans	Lycra mix	Maintain shape																				
Washing powder	Optical brighteners	Whiter whites																				
	Enzymes	Works at lower temps																				
Box of tissues	Synthetic detergent	No soap residue																				
	Microencapsulated menthol/scent	Fresh when used/ released as needed																				
Frozen pizza	Modified starch added to cheese	Stops running in oven																				
(c)	1 mark for each product from the printing and publishing sector.	[2 x 1]	e.g. Newspaper, book, magazine																			

Maximum Total Mark is 12

Question		Possible Answers	Mark	Additional Information
2		<p>For this question reward with a tick (✓) for each correct point</p> <p>Must relate to product shown</p> <p>1 mark for each feature shown:</p> <p>Look for Structure and then Technologies and then Materials/Components.</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</p> <p>Accept transfer/import of data/video/music/ring tones, 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>SUGGESTION: find 4 structural points, then 4 examples of technology, then the materials/components from what's left.</p> <p>Stop annotating/markings this question at 4 correct examples in each category i.e. 12 marks in total.</p> <p>Do not reward generics materials e.g. plastic, metal but accept trade names for example Perspex</p>

Maximum Total Mark is 12

Question			Possible Answers	Mark	Additional Information
3	(a)		Benefit of CAD drawings		
		(i)	<p>Two marks for a clear benefit identified.</p> <p>Can re-load so don't have to redraw to amend/develop etc Portable if saved to memory stick/pen drive/floppy etc Can be emailed/compressed and emailed etc Takes up less storage room than hard copy In case original file is damaged/corrupted Easily accessed by others on the network</p>	[2]	<p>Must be benefit of saving CAD file on computer</p> <p>One mark only for single word/phrase or vague but of a correct nature: Saves paper Don't lose work in case of fire</p>
			Benefits of CAD to produce manufacturing drawings		
		(ii)	<p>Two marks for each of two clear benefits identified.</p> <p>As above if not repeated or for example: Libraries of standard parts etc available – saves drawing Can explore different options Can model on screen (view in 3d to see all angles)</p>	[2 x 2]	<p>Markers will need to relate this to part (a)(i) of this question</p> <p>Must be a benefit of using CAD to produce drawings</p> <p>One mark only for single word/phrase or vague but on right track answer Saves time editing drawing Saves paper Quicker than drawing by hand Cheaper More professional/neater 'can see what it will look like'</p> <p>NOT more accurate</p>

Question		Possible Answers			Mark	Additional Information
		Other ICT applications and activities				
3	(b)	One mark for each cell correctly completed			[6 x 1]	<p>Accept proprietary software, but not as a repeat of the generic name.</p> <p>Evaluating could include internet searching to compare with other products.</p> <p>This could refer to aspects of their coursework or in an industrial application</p> <p>Do not reward repeat applications but if two different activities given the activities can both be rewarded.</p>
		Design task	ICT application	Activity carried out		
		Contact material supplier	Email package/word processor	Ask companies for a catalogue/about products		
		Evaluating design ideas	Word processor Spreadsheet database Presentation package	Make a questionnaire/ Add up results of Q Analyse client feedback Make charts Show ideas to client Complete forms		
Show designs to a client	Presentation package (PowerPoint) Desktop publishing package	Project onto screen/ Slideshow with a talk Put together drawings and notes				
Maximum Total Mark is 12						

Question		Possible Answers	Mark	Additional information
		In each part: <u>one</u> mark for a suitable product and <u>one</u> for appropriate technology (or modern material including aluminium alloy (accept aluminium), stainless steel, carbon fibre, where appropriate) Do not accept alloy on its own.		If product and technology are transposed reward accordingly. If no product given do not reward technology. Products can be rewarded if no technology given provided technology can be used to reduce the "weight" Tick must be placed where a single mark is awarded
4	(a)	Racing car/golf club/bike frame – carbon fibre Surfboard/packaging/ – expanded polystyrene foam	[2 x 1]	If product and technology are transposed reward accordingly. If no product given do not reward technology. Products can be rewarded if no technology given provided technology can be used to reduce the "easier to use" Tick must be placed where a single mark is awarded Accept honeycomb structure
	(b)	Computer – wireless network/touchscreen/GUI(Graphical user interface) Car – power steering/SatNav Flip top lids – polypropylene Mobile phones – Blue tooth	[2 x 1]	If product and technology are transposed reward accordingly. If no product given do not reward technology. Products can be rewarded if no technology given provided technology can be used to reduce the "safer" Tick must be placed where a single mark is awarded Accept software as a technology Do not reward ergonomics (science not a technology) Do not reward lighter unless manoeuvrability important.
	(c)	Car – roll bars/crumple zones/airbags/inertia reel seat belts Hot air paint stripper – auto cut out when overheats Mobile phone – hands free kits/locking/passcodes Fireman's jacket – fire retardant material / Nomex	[2 x 1]	Direct safety Or indirect as in reducing the likelihood of being a victim of crime. Not simply seat belts (must be qualified)

Question		Possible Answers	Mark	Additional Information
4	(d)	<p>N.B. This response appears at the end of the QIG Carrier bag – biodegradable plastics Prius car – electric operation Car – engine management system/catalytic converter/green diesel/petrol</p>	[2 x 1]	Accept weight reduction measures in vehicles Accept noise reduction e.g. Mobile phone – development of silent mode/vibrating alerts Accept recycling as a technology if appropriate
	(e)	One mark for making a relevant point. The workforce will need to be trained The company will need to buy new equipment/modify designs/stop production during changeover	[2 x 1]	Not single word like cost or training Do not reward cost or expensive unless qualified NB redundancy only if disadvantage to company is clear it is a disadvantage to the employee. Pay offs, social conscience, reputation
	(f)	Benefits to society could include improved public safety, improved public health, improved transport systems Water filtration systems provide clean drinking water in remote areas/portable/solar powered Medical diagnostic equipment (ultrasound/CAT/PET/MRI scans, X rays) detect illness early improving outcomes/monitor progress Medicines – eradication of some disease, improved life exp Surveillance cameras: help crime detection can be triggered by movement saves energy use Traffic signs: can respond to traffic density/speed making roads safer. Mobile Phone: can call emergency services promptly preventing crime/SMS – unobtrusive communication, reassures parents.	[2 x 2]	The question is about “Society” not an individual No marks for giving a product Benefits must relate to the product stated One mark for making a correct point related to society Further mark for details/explanation giving how/why a benefit to society May be 2 benefits of the same technology or two different technologies The question is about “Society” but you can accept ONE “Environmental” improvement for one mark, but the second mark requires specific details how society benefits
Maximum Total Mark is 14				

Question		Possible Answers			Mark	Additional Information
5	(a)	For each of the two types of material chosen: 1 mark for each cell in the table correctly completed. Examples:				Ignore when the words “biological / polymers / textiles / alloys / Food ingredients” are used. These are copies / repeats from the question. Specific materials only: Not wood, metal, fabric, liquid, gas Accept brand names, e.g., GeneTex, Lycra Accept transpositions between Materials and Product Property must relate to product and specific material Material must be used in the product not on the product after production Material alone can gain a mark. There must be a material to gain the product and property marks For materials read ingredients / components Product may be repeated Properties could be same / similar for different materials
		Specific Material	product	Property		
		Biological probiotic enzymes	Pb yogurt	Help digestive bacteria		
		enzymes	Washing powder	Break down proteins		
		antibacterial coating	Sports socks	Kill bacteria		
		Polymers- polyurethane Polypropylene	Children’s toys Hinged shampoo lid	self coloured Will bend repeatedly		
		Textiles- Breathable fabric	Sports clothing	Allows water vapour out		
Lycra rich fabric Polymer coated fabric	Swimwear raincoat	Stretch fit waterproof				
Alloy- Stainless steel Duralumin	Cutlery Aeroplane	Resists corrosion Strong and lightweight i.e. strength to weight ratio				
Food ingredients Sugar Aspartame Enzymes	Cake Cola Bread	Sweet Artificial sweetener (not a preservative) Retains freshness tasteless,	[2 x 6]			

Question			Possible Answers			Mark	Additional Information
			Tofu	Meat substitute	odourless, flavourless texture less equal protein content to meat		
			Composites- GRP concrete	Sports car body panels Road bridge	lightness/great strength high compressive strength mixed on site		
			Benefits to consumer				
5	(b)		<p>No mark for giving material name. Two marks for describing a benefit to consumers of using that material in a product.</p> <p>Eg first mark – second mark Probiotic enzyme – reduces bloating – by improving gut health Antibacterial coating – stops smelly feet – by killing bacteria. Polyurethane – easy to clean – so hygienic, Polypropylene – low cost PP - makes product easier to use – don't have to unscrew cap Breathable fabrics – increase comfort – by allowing sweat out Lycra rich fabric – maintains its shape fit – through washing Polymer coated fabric – soft feel- unlike waxed cotton Stainless steel – stays shiny – unlike silver cutlery.</p>			[2]	<p>One mark for making a positive, relevant point, second for how/why/when a benefit, or comparison (implied OK).</p> <p>Benefit specifically to consumers, not a property</p> <p>Do not penalise twice from a previous question part, for example where a property of aspartame was quoted as preservative in part (a) accept 'doesn't go off quickly' here.</p> <p>May be repeated properties from part (a)</p> <p>Reward material even if not correctly identified in part a</p>
							Maximum Total Mark is 14

Question		Possible Answers	Mark	Additional Information		
6	(a)	One mark for each correct cell in table. Examples	[6]	<p>Must make sense when followed horizontally and so each can be rewarded individually.</p> <p>Do not reward repeat of welder as given in example.</p> <p>Product (or repeat products) can be rewarded even if process or end effector points given by candidate are incorrect or not given, provided product could be produced part produced by robotics</p>		
		Product			Robotic task	Type of end effector
		Motor vehicle			Windscreen installation	Vacuum grip
		Computer motherboard			Paint spraying	Spray gun /sprayer/nozzle
		Many	Packaging	Pneumatic grip		
	(b)	(i)	<p>One mark for each of 2 appropriate uses in production Eg controlling conveyors, controlling temperatures for heat treatment, timing a sequence of processes, etc. Or generic such as 'repetitive tasks', 'checking/monitoring production'.</p>	[2 x 1]		
		(ii)	<p>Two marks for each of 2 advantages over general purpose computer control clearly described.. Eg The program can control complex sequencing/PLC can handle multiple inputs and outputs at the same time. Unlike general-purpose computers, the PLC is designed for (any of the following): <ul style="list-style-type: none"> extended temperature ranges dirty or dusty conditions immunity to electrical noise resistant to vibration/impact PLC is mechanically more rugged. PLC battery powered so OK if power cut. Modular design makes replacement straightforward when faulty. The program is stored in battery-backed memory and/or EEPROMs/so don't need to reload after power cut.</p>	[2 x 2]	<p>One mark for simple unqualified statement of benefit. more flexible more robust longer life compact size (loaf of bread) modular</p> <p>No marks if benefit given which is not a specific advantage over general purpose computer PLC can carry out repetitive operations Can be used in hazardous environments Consistency of output Need smaller workforce Can be programmed</p>	
Maximum Total Mark is 12						

Question		Possible Answers	Mark	Additional Information
		CIM means		Tick relevant points which are being rewarded
7	(a)	<p>0-4 marks but link has to be one of the points to gain the 4th mark. i.e. maximum mark of 3 unless “link” is identified</p> <p>Computer Integrated Manufacturing systems use ICT to:</p> <p>link (1) Has to be clearly explained not implied manage/control (1) all of the processes (1) from design to dispatch (1) one set of computer files (1).</p>	[4]	<p>Details of processes from design to dispatch':</p> <ul style="list-style-type: none"> • <i>design,</i> • <i>marketing,</i> • <i>production planning,</i> • <i>material supply and control,</i> • <i>processing-production,</i> • <i>assembly and finishing,</i> • <i>packaging and dispatch</i> <p>One mark for link between CAD CAM maximum</p>
		CIM = Quality?		
	(b) (i)	<p>Two marks for clear description.</p> <p>Improve product quality because there are no errors in transferring design information to production.</p> <p>Integrated checks reduce risk of inferior materials and components entering production.</p> <p>Monitoring/resetting machines as needed means production quality is maintained.</p> <p>Errors identified are corrected automatically</p>	[2]	<p>One mark only for simple statement e.g. Generic CAM benefit:</p> <p>More accurate/less errors Consistent product</p> <p>No marks for better designs or ‘computers are better than people’ type response.</p>
		Production Planning efficiency		
	(ii)	<p>Two marks for each of two clear descriptions.</p> <p>Use materials/people/machinery more efficiently because production planning informed by current information about performance, so need less ‘slack’ in system.</p> <p>supports JIT – more efficient stocking computer calculates most efficient sequence of operations and monitors and modifies it to keep efficient .</p> <p>Barcoding of products/batches allows order tracking throughout the production process.</p> <p>Less machine downtime because all machines are monitored and maintenance is planned at the same time for minimum disruption to schedule.</p>	[2 x 2]	<p>Need to demonstrate understanding of production planning (1 mark) and link to features of CIM for 2nd mark</p> <p>Award one mark for either of the above</p> <p>Place tick against a correct response if less than 4 marks awarded</p>

Question			Possible Answers	Mark	Additional Information
			Lead time		
		(iii)	One mark for each appropriate reason stated. To maintain a competitive edge in the marketplace. To reduce development cost Start making profit sooner Recoup investment sooner Money coming in from sales sooner	[2 x 1]	Do not accept points in the question stem: "shorter time taken to get a new product onto the market..." Accept one 'to keep customers happy' type response if related to benefit to manufacturer.
					Maximum Total Mark is 12

Question		Possible Answers			Mark	Additional Information	
8		Annotation with ticks: 3 relevant issues, 2 why relevant, 1 example or evidence to support answer.					
	(a)	Impact of control technology on production safety				<p>Accept a well reasoned discussion rewarding positive points / observations accordingly One mark for a generic statement e.g. 'makes production processes less dangerous'</p> <p>Accept a reference to potential hazards from unsupervised equipment but not to 'if they go wrong'</p> <p>Do not reward repeated points</p> <p>One mark ONLY for showing an understanding of safety in production (i.e. without any control mentioned)</p>	
		Issues	Relevance	Examples			
		Automated cut outs	Protection of people from hazards	machine won't work without guard in place			
		Robots are an example of control technology	They can replace humans in hazardous environments	Such as paint spray booths			
		Can monitor machines/equipment	Can isolate/take out of service/warn before danger point reached	Temperature of furnace doors			
		Less human decision-making and intervention	Less danger from human error/Workers less stressed – less likely to have accidents	Laser beams trip activate to turn machine off. To prevent workers from injury	[6]		
	(b)	Impact of ICT on range of products available.					
		Issues	Relevance	Examples		<p>Points MUST relate to the range of products available, either wider range of features or additional products made possible.</p> <p>One mark ONLY for showing understanding of range of products but not mentioning ICT.</p> <p>Do not reward repeated points</p>	
		Products may contain microprocessors	That can be programmed to offer a wide range of features	digital cameras: have different programs installed for each model (editing), but are physically almost identical			
		Can order products via www	Products that are not on sale in UK can be bought from other countries	new games console/etc			

Question			Possible Answers			Mark	Additional Information
			ICT is used in CAD	Creating designs which can readily/economically be developed/customised/updated Giving a wider range			
			CAD allows designs to be developed quickly/readily	Can respond quickly to results of market research/customer feedback Can expand into new markets rapidly And, with CAM prototyping and customised manufacture	Make LHD cars for UK Nike customised sports shoes		
			Data from research/customer feedback can be analysed using ICT			[6]	
							Maximum Total Mark is 12

Grade Thresholds

General Certificate of Secondary Education
Applied Engineering (Double Award) (Specification Code 1492)
June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
4866	Raw	50	45	40	35	30	25	20	15	10	0
	UMS	100	90	80	70	60	50	40	30	20	0
4867	Raw	50	45	40	35	31	25	20	15	10	0
	UMS	100	90	80	70	60	50	40	30	20	0
4868	Raw	100	70	62	54	46	41	36	31	26	0
	UMS	100	90	80	70	60	50	40	30	20	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*A*	AA	BB	CC	DD	EE	FF	GG	UU
1492	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*A*	AA	BB	CC	DD	EE	FF	GG	UU	Total No. of Cands
UMS	270	240	210	180	150	120	90	60	0	
Cum%	0.8	7.1	19.9	39.4	57.8	72.8	86.3	94.7	100	1278

1278 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see:

http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

**General Certificate of Secondary Education
Applied Manufacturing (Specification Code 1496)
June 2008 Examination Series**

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
4878	Raw	50	45	40	35	31	25	19	14	9	0
	UMS	100	90	80	70	60	50	40	30	20	0
4879	Raw	50	44	40	36	32	26	20	15	10	0
	UMS	100	90	80	70	60	50	40	30	20	0
4880	Raw	100	77	66	55	45	39	33	27	21	0
	UMS	100	90	80	70	60	50	40	30	20	0

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*A*	AA	BB	CC	DD	EE	FF	GG	UU
1496	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*A*	AA	BB	CC	DD	EE	FF	GG	UU	Total No. of Cands
UMS	270	240	210	180	150	120	90	60	0	
Cum%	1.0	7.3	23.0	43.6	62.7	76.3	86.9	94.6	100	899

899 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see:

http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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