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GCSE

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Engineering (5318/2316)

Summer 2006

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• Ammunition boxes</td><td>2 x 1</td><td>2</td></tr>
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<tr><td>2.</td><td>(a)
(b)</td><td>(i)</td><td>A nut (1) locking nut (1) metal locknut (1)
A mechanical fastener (1) used with a bolt (1) hold components together (1)

Locknut - Deformed internal nylon thread produces a friction fit (1) with external thread of a bolt. Produces a locking action (1) that allows for temperature and vibration variations (1)
Low response (1) or two low responses (2) or similar

Award up to 2 marks for follow through</td><td>1 x 1

2 x 1</td><td>3</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Blind rivet (1) Pop rivet (1) Rivet (1)
Used to join two parts together (1) when access is from one side only (1) used on sheet metal (1) semi or permanent fixing (1) or similar
Low response (1) or two low responses (2)

Award up to 2 marks for follow through</td><td>1 x 1

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<tr><td>3.</td><td></td><td></td><td>Key terms linked to a key area
<table>
<tr><td>Quality control</td><td>control technology</td></tr>
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<tr><td>Thermo-ceramics</td><td>modern materials</td></tr>
</table>
No marks awarded where 2 lines are drawn from a term except for CAM if both lines are correct.</td><td>1 x 1
1 x 1
1 x 1
1 x 1
1 x 1
1 x 1</td><td>6</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>(6)</td></tr>
<tr><td>4.</td><td>(a)</td><td>(i)</td><td>Appropriate product belonging to the Fabrication sector</td><td>1 x 1</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Appropriate explanation of what the product does, may include reference to features and function
1 mark for each relevant point up to 2 marks
If (i) is inappropriate allow Follow Through up to 1 mark
If no product named in (i) no Follow through awarded</td><td>PR2</td><td>2</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>State one modern material used in manufacture of product
• Appropriate modern material currently in use.
Allow generic term, accept plastic
Mark can be awarded if modern material does not relate to product named in 4a (i)</td><td>1 x 1</td><td>1</td></tr>
</table>

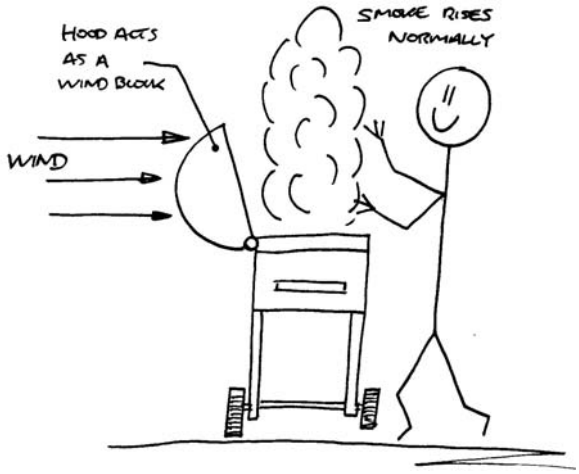
		(ii)	**Appropriate explanation of benefits to design of product** Low response (1) or two low responses (2) or detailed response (2) No follow through if material not named in (i) otherwise maximum follow through Follow through restricted to 1 mark if product not named in 4a(i)	1 x 1 1 x 1 or 1 x 2	2
	(c)	(i)	**State the stage where Control Technology used such as:** • design (1) marketing (1) production planning (1) materials – supply and control (1) processing (1) assembly/finishing (1) packaging/dispatch (1) • or appropriate description of stage Mark can be awarded if stage does not relate to product named in 4a(i)	1 x 1	1
		(ii)	**Appropriate advantage to manufacturer e.g**. • accuracy, consistency, speed Must be relevant to stage given in 4(c)(i). Basic statement in general terms (1) More detailed statement relating advantage to the manufacturer (2) Allow Follow Through where appropriate	1 x 1 or 1 x 2	2
					(9)

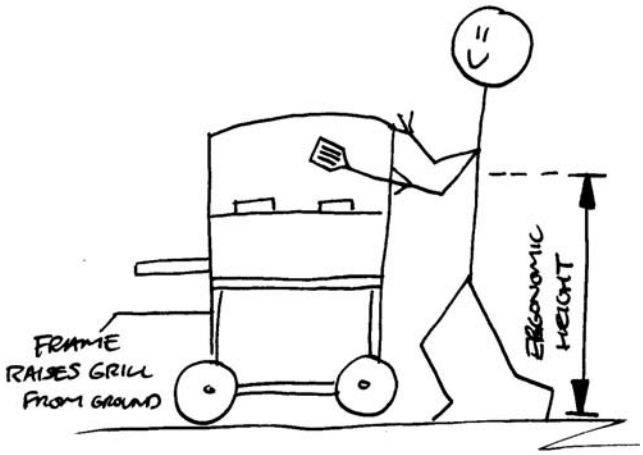
Question			Expected answers	Mark allocation	
5.	(a)		**Give two examples of communications technology eg.** • E-mail (1), Internet (1) EDI (1), ISDN (1) broadband (1) Video Conferencing (1) • Mobile phone or phone (1) Fax (1) Internet phone (1) pager (1) walkie-talkie (1) • Electronic Point of Sale (EPOS) (1) Do not accept land-line or radio **Explain two benefits of using communications technology eg.** • Speed (1) and accuracy (1) of communication • Enables JIT manufacture (1), reduces need for stock and cost of storage (1) • Enables manufacturing to meet consumer demand (1) • Use of EPOS distribution to record (1), sort and store sales information in database (1) • Calculate stock levels (1) and order fast selling products electronically (1) • Use of email to send data on sales (1) • easier/faster access to information/data (1) – through email/Internet (1) • easier/faster access to suppliers (1) – through electronic communications (1) • reduced material costs (1) – through access to wide range of suppliers (1) • reduced lead times/faster time to market (1) – as JIT manufacturing can occur (1) • easier/faster collection of sales information (1) – through EPOS tills • increased market share (1) - through Internet marketing (1) • or similar Low response (1) or two low responses (2) or detailed response (2) x 2 examples Do not allow follow through	**1 x 1** **2 x 2**	1 4
	(b)		**Any one explanation, such as:** • wider range of products available (1) – through faster time to market (1) • reduced product price (1) – through reduced material costs (1) • fast ordering of out of stock sizes (1) – through EPOS tills (1) • easy/fast access to wide variety of products (1) – through on-line shopping • can order custom-made products (1) – can manipulate virtual product on-line (1) Or similar Low response (1) or detailed statement (2) or two low responses (2)	**1 x 1** 1 x 1 or 1 x 2	2
					(8)

6.	(a)		Give **two** examples of manufacturing activities where a traditional method of manufacture has been replaced by the use of CAM. Traditional / CAM Oxyacetylene cutting / Laser cutting Manual machining process i.e. lathe / CNC machining i.e. CNC lathe Manual materials handling retrieval and storage / Automatic/CNC materials handling, retrieval and storage by hand Or similar Traditional method (1) and CAM method (1) x 2 examples Do not accept two of the same type	1 x 1 1 x 1 1 x 1 1 x 1	2 2
	(b)		**For each activity in 6(a) describe one advantage of using CAM compared with traditional method e.g.** • speed and efficiency (1) – less time taken to machine components (1) • consistency of product e.g. within tolerance • lowers cost of complex products e.g. those using complex components • higher production rates (1) – through lower workforce requirement (1) • better quality output (1) – less likelihood of human error and unreliability (1) • increased safety in workplace (1) – machines have sensors to stop them if a fault occurs (1) • complex operations can be carried out (1) turning, milling and drilling on one work piece (1) • reduced materials/waste/processing costs (1) – model the most efficient use of materials and processes (1) • processes can be repeated easily and precisely (1) data is stored and easily reloaded (1) Answers must relate to activities given in 6(a) Low response (1) or detailed statement (2) Activity 1 advantage(1) Activity 2 advantage (1) Allow Follow Through max of one mark if 6a(i) attempted	**1 x 1** 1 x 1 or 1 x 2 **1 x 1** 1 x 1 or 1 x 2	2 2
					(8)

Question			Expected answers	Mark allocation	
7.	(a)		**Impact of control technology on safety in manufacture:** • safer for workers (1) – through use of sensors on machines (1) • can handle hazardous processes (1) – through use of CNC machines (1) • does not suffer from fatigue and make errors relative to safety aspects (1) – can work continuously (1) Or similar Low response (1) or detailed statement (2) or two low responses (2)	1 x 1 1 x 1 OR 1 x 2	2

	(b)		**Impact of control technology on efficiency of methods of production:** • more efficient, does not tire (1) • once set up correctly will continue to produce to a given standard (1) • less waste (1) Or similar Low response (1) or detailed statement (2) or two low responses (2)	1 x 1 1 x 1 OR 1 x 2	2
					(4)
			Total marks for Section A		**45**

SECTION B					
8.		(a)	**Function of the hood**  • Acts as a wind break to control flow of smoke (1) • Prevents dust/ dirt from falling on food being prepared (1) • Protection of cooking surfaces when in storage (1) increases durability of BBQ (1) • Can be used to 'smoke' foods (1) • Or other suitable response Diagrams up to 2 marks, notes up to 2 marks, max 3 marks	3 x 1	3

		(b)	**Function of the frame**  • Support structure for barbecue (1) bears weight of other components (1) • Provides a structure for other components to be fitted to (1) including wheels for portability (1) • Enables food preparation at an ergonomically correct height (1) • Allows for storage of utensils, gas bottle etc. (1) • Or other suitable response Diagrams up to 2 marks, notes up to 2 marks, max 3 marks	3 x 1	3
					(6)

Question			Expected answers	Mark allocation	
9.	(a)		**Two missing stages:** • Production planning (1) • Assembly and finishing (1) Answers must be in the correct order	1 x 1 1 x 1	2
	(b)		**Stage where hood is press formed:** • Processing - production (1)	1 x 1	1
					(3)
10.	(a)	(i)	**Specific material commonly used for burners:** • Cast iron (1) iron (1) • Stainless steel (1) steel (1) Or similar	1 x 1	1
		(ii)	**Specific material commonly used for the hood:** • Mild steel (1) steel (1) • Stainless steel (1) • Aluminium (1) Or similar	1 x 1	1
	(b)	(i)	**Porcelain-enamelled metal:** • porcelain enamel is a form of glass (1) bonded (1) to metal on a molecular level (1) at high temperature (1). Or similar Background: Porcelain Enamel begins as a blend of minerals smelted in much the same manner as common glass. During this process (known as "fritting"), the red-hot, molten mixture is poured from a smelter and quenched between water-cooled rollers. This quick-cooled ribbon of glass is then shattered forming a particulate known as "frit". Frit is applied to metal using either a wet or dry method and fired at very high temperatures - generally ranging from 1100 to 1600 degrees Fahrenheit. While in the furnace, the frit melts…bonding with the metal to create more than a coating. It forms an inseparable compound merging the chemical makeup of the frit and metal; resulting in a new, chemically unique, finish.	1 x 1 1 x 1	2
		(ii)	**Justification of use of porcelain enamelled metal:** • Long lasting, glass hard surface • Resistance to corrosion • Abrasion and scratch resistant • Will not scorch, burn or discolour at sustained high temperatures • Easily wipe cleaned • Hygienic – no pores or scratches to provide bacteria with a place to grow • Excellent thermal expansion properties Or similar	1 x 1 1 x 1 1 x 1	3

	(c)		**Appropriate explanation of how use of modern materials has made gas barbecues appeal to domestic market e.g.** • lightweight (1) durable (1) for hard wear characteristics (1) • tough (1) strong (1) to provide protection (1) • water-resistant (1) for weather protection (1) • more aesthetically pleasing (1) with moulded components (1) Or similar Low response (1) or three low responses (3) or detailed response (2) or any combination	1 x 1 1 x 1 1 x 1 PR3	3
					(10)

Question			Expected answers	Mark allocation	
11.	(a)	(i)	**Design** Statement must be applicable to a gas barbecue, such as: • development of design brief (1) and design specification (1) listing design criteria (1) performance requirements (1) cost of materials and components (1) and how product might be manufactured (1) quality standards (1) safety standards (1) • development of design ideas (1) CAD modelling (1) and prototyping before manufacture (1) Low response (1) or two low responses (2) or detailed response (2)	1 x 1 1 x 1 OR 1 x 2	2
		(ii)	**Marketing** Statement must be applicable to a gas barbecue, such as: • developing marketing plan (1) using market research (1) to ensure barbecue sells well to domestic target market (1) • developing competitive edge (1) through providing reliable (1) high quality barbecues (1) at price consumers can afford (1) • advertising (1) and promotion (1) of barbecues through retailers (1) the media (1) and the Internet (1) Low response (1) or two low responses (2) or detailed response (2)	1 x 1 1 x 1 or 1 x 2	2
		(iii)	**Materials supply and control** Statement must be applicable t a gas barbecue, such as: • Availability and purchase (1) of suitable metals, polymers, finishes and bought-in components (1) to ensure production can start (1) and continue (1) Low response (1) or two low responses (2) or detailed response (2)	1 x 1 1 x 1 OR 1 x 2	2
		(iv)	**Production** Statement must be applicable to the barbecue, such as: • Injection moulding of plastic components (1) • Press forming of the hood (1) • Casting of metal components (1) • Bending (1) and welding (1) of tubular frame (1) Low response (1) or two low responses (2) or detailed response (2)	1 x 1 1 x 1 OR 1 x 2	2

(b)	(i)	**Type of ICT used** • Computer-aided Design (CAD) (1) including 'virtual reality' (1) and 3-D/ solid modelling (1) • Desk-top Publishing (DTP) (1) • Word processing (1), Spreadsheets (1) and Databases (1) • E-mail (1) and Internet (1) Or similar Accept any appropriate software e.g. ProDesktop **Description of use of ICT** Must be applicable to type of ICT, such as: • Word processing of reports (1) during product development to aid evaluative process (1) • Using 3-D modelling techniques to design and modify the barbecue (1) and calculate quantity of materials required for manufacture (1) • Storage of information (1) range of types of barbecues/components (1) and information in database (1) • Use CAD modelling (1) of components (1) for different shapes/assemblies (1) • Create and modify design ideas (1) • Producing drawings (1) of component parts (1) and assembly of the barbecue (1) • Present virtual products to client (1) • Make accurate working drawings (1) manufacturing specifications (1) • Develop 3D images (1) • Produce cutting lists (1) for range of sizes (1) • Send CAD information to client (1) for approval (1) Or similar Allow follow through if description is appropriate to design stage (2) Description: Low response (1) or two low responses (2) or detailed response (2)	1 x 1 2 x 1	1 2

		(ii)	**Benefits of this use of ICT** • Product information available for whole design team (1) • Speed (1) and efficiency (1) of modelling (1) and modification of ideas (1) • Ease/speed (1) of creating virtual products (1) on screen (1) • Speed of decision making (1) by client (1) • Easy access to design data (1) working drawings (1) and manufacturing specifications (1) for whole team (1) • Easy access to existing patterns and components (1) in company database (1) • Efficiency of costing materials (1) and using lay plans that minimise waste (1) • Speed of decision making for design team / client (1) Or similar Low response (1) or three low responses (3) or detailed response (2) Allow Follow Through if type is named or described in b(i) (3 marks)	1 x 1 1 x 1 1 x 1 OR 1 x 1 1 x 2	3
	(c)	(i)	**Type of quality control used** • Co-ordinate Measurement Machine (CMM) (1) • Optical sensors (1) • Inspection (1) and Testing (1) • Control charts (1) Or similar **Description of quality control use** Must be applicable to type of quality control, such as: • Use QC to test (1) and monitor production (1) e.g. pressure testing of parts (1) with no faults (1) • Use of specifications to monitor quality (1) and BS standards (1) • Use of inspection processes (1) at critical control points (1) to identify faults (1) • Use of variable quality indicators (1) e.g. correct sizes of parts (1) with no faults (1) • Use of attributes (1) e.g. frame or injection moulded parts correct colour (1) • Inspection – examining components in batches (1) in order to check that they are within a specified tolerance (1) • Testing – of components and final product (1) to determine physical properties (1) i.e. Forces required to crack or destroy components or products (1) Or similar Allow follow through if description is appropriate to QC (2 marks) Description: Low response (1) or two low responses (2) or detailed response (2)	1 x 1 2 x 1	1 2

		(ii)	**Explanation of benefits** • Inspection of components - in order to function properly (1) acceptable in accordance with its specification (1) and external standards (1) i.e. BS, EN, ISO • Faults quickly picked up (1) machinery adjusted with minimum disruption to production (1) saving both time and money (1) • Data from probes or optical sensors is directly inputted into a computer system (1) and reports can be generated (1) • Provides feedback (1) to production system (1) • Production of high quality barbecues (1) with no faults (1) • Production of identical (1) barbecues that meet specifications (1) • Production of barbecues that meet client (1) and consumer expectations (1) • Production of barbecues on time (1) and to budget (1) Or similar Explanation: Low response (1) or two low responses (2) or detailed response (2) Allow Follow Through if type is named or described in c(i) (3 marks) For example: CMM provides instant (1) and consistent (1) data capture. CMM can interface with existing ICT systems (1) so that all workers/ manufacturing cells can access information (1) for integrated quality inspections (1).	3 x 1	3
					(20)

Question			Expected answers	Mark allocation	
12.	(a)		**The impact of modern technology on the design and development of gas barbecues, e.g.** • greater design variety/choice (1) • improved product aesthetics (1) through use of CAD (1) • improved product performance (1) through use of modern materials (1) and 3D prototyping (1) • faster product development (1) and time to market (1) • well designed (1) cost effective competitive products (1) Or similar Low response (1) or two low responses (2) or 3 low responses (3) or more detailed response (2)	PR3	3
	(b)		**The impact of modern technology on improved characteristics of gas barbecues, e.g.** • use of ICT in market research (1) enables manufacturer to match barbecues to market needs (1) • use of modern materials gives improved functional characteristics (1) such as weather resistance (1) hygiene (1) etc • use of modern materials gives improved aesthetic characteristics (1) such as organic rounded shapes by using injection moulded components (1) • use of modern materials provides protection (1) such as resistance to weather (1) • use of quality control (1) and process control (1) enables consumers to receive products fit for purpose (1) that meet price requirements (1) Or similar Low response (1) or two low responses (2) or 3 low responses (3) or more detailed response (2)	PR3	3
					(6)

Question			Expected answers	Mark allocation	
13	(a)		**Evaluate the effect that the use of ICT has had on materials supply and control for the gas barbecue** • can source and handle materials supply data (1) using spreadsheets (1) databases (1) • greater control of materials ordering (1) though electronic communications (1) • easier and faster contacts with suppliers (1) through use of email (1) ISDN (1) and video conferencing (1) • manufacturers can find cheapest suppliers (1) using the Internet (1) • enables Just in Time ordering (1) and reduced stock levels (1) Or similar Low response (1) or five low responses (5) or detailed response (2) or any combination	PR5	5
	(b)		**Evaluate the effect that the use of ICT has had on supply and demand for gas barbecues** • enables Quick Response to demand (1) through use of Electronic Point of Sale terminals (EPOS) (1) that monitor consumer demand (1) • can raise orders instantly (1) to enable faster consumer access to required product (1) • enables manufacturer to batch produce on demand (1) • reduces need for retailers to keep stock (1) and lowers storage costs (1) • use of Internet marketing of products (1) enables increased awareness of product features (1) and increases demand (1) Or similar Low response (1) or five low responses (5) or detailed response (2) or any combination	PR5	5
					(10)
			Total Marks for Section B		**55**
			Total Marks for Paper		**100**

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