

GCSE

Edexcel GCSE

Engineering (2316) Paper 04

Summer 2005

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Mark Scheme (Results)

5318/ 04 MARK SCHEME

Question		Expected answers		Mark allocation	
SECTION A					
1.	(a)		Door handles Mountain bike frame	2 x 1	2
	(b)		Portable barbecue Filing cabinets	2 x 1	2
					(4)
2.			Split pin or pin Metal fastening (1) used to join/keep components together (1) used on a spindle (1) pushed into a pre-drilled hole (1). <i>Low response (1) or two low responses (2)</i>	1 x 1 2 x 1	1 2
			Bolt Mechanical fastening (1) used with a nut (1) Can be used to 'bolt' / hold components together (1) tightened (1) <i>Low response (1) or two low responses (2)</i>	1 x 1 2 x 1	1 2
3.	(a)	(i)	<ul style="list-style-type: none"> • Database • Internet 	1 x 1	1
		(ii)	<ul style="list-style-type: none"> • Spreadsheet 	1 x 1	1
	(b)		<ul style="list-style-type: none"> • Quality control • Process control (sensors) 	1 x 1	1
	(c)	(i)	Appropriate modern or smart material e.g. Shape memory alloy, or modern alloy	1 x 1	1
		(ii)	A smart material: <ul style="list-style-type: none"> • Responds to temperature / light and change in some way • Senses and responds to conditions in the environment • Appears to 'think' / some have a 'memory' as they revert back to their original state. <i>Low response (1) or two low responses (2) or detailed response (2)</i>	1 x 1 1 x 1 or 1 x 2	2
					(6)
4.	(a)	(i)	Appropriate product e.g. mountain bike	1 x 1	
		(ii)	Appropriate explanation of what the product does, may include reference to features and function <i>Low response (1) or two low responses (2) or detailed response (2)</i>	1 x 1 1 x 1 or 1 x 2	2
	(b)	(i)	Appropriate modern material currently in use and appropriate to the product e.g. carbon fibre, titanium, aluminium alloy etc	1 x 1	
		(ii)	Appropriate explanation of benefits to user of named modern material <i>Low response (1) or two low responses (2) or detailed response (2)</i> <i>Allow follow through where appropriate</i>	1 x 1 1 x 1 or 1 x 2	2

	(c)	(i)	Named process control appropriate to product e.g. computer control of CNC machine (lathe, mill, router, laser etc) <i>No marks for 'automation'</i>	1 x 1	1
		(ii)	Appropriate advantage, e.g. accuracy, consistency <i>Low response (1) or two low responses (2) or detailed response (2)</i> <i>Allow follow through where appropriate</i>	1 x 1 1 x 1 or 1 x 2	2
Question					
			Expected answers	Mark allocation	
5.	(a)	(i)	Appropriate CAD modelling technique appropriate used in design of fabricated products e.g. <ul style="list-style-type: none"> • 3D modelling of component or product • 2D draughting <i>Low response (1) or two low responses (2) or detailed response (2)</i>	1 x 1 or 1 x 2	2
		(ii)	Why CAD modelling is key industrial process <ul style="list-style-type: none"> • Can test and modify ideas in 2D (1) simulate 3D products on screen (1) show virtual product to client before sampling (1) • Reduces need for sampling wide range of products (1) saves time (1) and costs (1) <i>One mark for appropriate response from each bullet</i>	1 x 1 1 x 1	2
	(b)	(i)	Appropriate use of CAM in fabrication e.g. <ul style="list-style-type: none"> • Use of CNC machinery for cutting and shaping - lathe, mill, router, drill etc <i>Low response (1) or two low responses (2) or detailed response (2)</i>	1 x 1 or 1 x 2	2
		(ii)	Appropriate benefit to consumer of manufacturing using CAM e.g. <ul style="list-style-type: none"> • Consistency of product –safer, better quality, more accurate etc • Lowers cost of complex products • Faster time to market • Wider choice of products • Manufacturer can change methods easily to meet customer demands. <i>Low response (1) or two low responses (2) or detailed response (2)</i> <i>Allow follow through where appropriate</i>	1 x 1 or 1 x 2	2
					(8)
6.	(a)	(i)	Appropriate way to communicate between suppliers and manufacturers e.g. e-mail (1) EDI (1) ISDN (1) Extranet (1) Video conferencing (1)	1 x 1	1

	(ii)	<p>Appropriate benefit to manufacturers of using ICT to talk to suppliers e.g.</p> <ul style="list-style-type: none"> • Speed and accuracy of communication • Enables JIT manufacture, reduces need for stock and cost of storage • Enables manufacturing to meet consumer demand <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 or 1 x 2</p>	2
(b)	(i)	<p>Appropriate way to communicate between retailers and manufacturers e.g.</p> <ul style="list-style-type: none"> • Use of EPOS distribution to record, sort and store sales information in database • Calculate stock levels and order fast selling products electronically <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 or 1 x 2</p>	2
	(ii)	<p>Appropriate benefit to retailers of using ICT to talk to manufacturers e.g.</p> <ul style="list-style-type: none"> • Fast ordering of components/parts • Fast delivery of products in response to changing consumer demand • High reputation of retailer, improved sales <p><i>Low response (1) or three low responses (3) or detailed response (2) or any combination</i></p>	<p>1 x 1 1 x 1 or 1 x 1 1 x 2 or 1 x 3</p>	3
				(8)

Question		Expected answers	Mark allocation	
7.	(a)	<p>Appropriate description of CIM e.g.</p> <ul style="list-style-type: none"> • CIM systems integrate use of all different functions of computers in company • Uses Product Development Management (PDM) systems to manage concurrent design and manufacture • Involves use of CAD, CAM, modelling and simulation, sensors in manufacturing control, CAD/CAM, automation and robotics <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 1 x 1 or 1 x 2</p>	2
	(b)	<p>Appropriate benefit to manufacturer of using CIM e.g. enables;</p> <ul style="list-style-type: none"> • Fast, efficient, cost-effective manufacturing • Concurrent manufacturing and faster time to market • Management of design, development, production planning, QC, materials supply & control • Communication between product development, production teams, suppliers and retailers • Access to technical / organisational information about product by design and production team • Reduction in product time to market using JIT <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 1 x 1 or 1 x 2</p>	2
				(4)
Total marks for Section A				45

<i>Question</i>	<i>Expected answers</i>	<i>Mark allocation</i>
SECTION B		

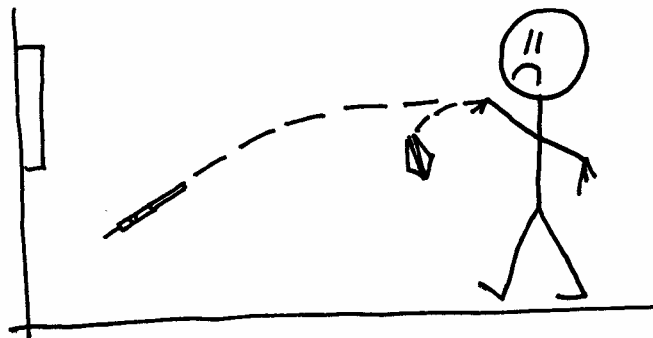
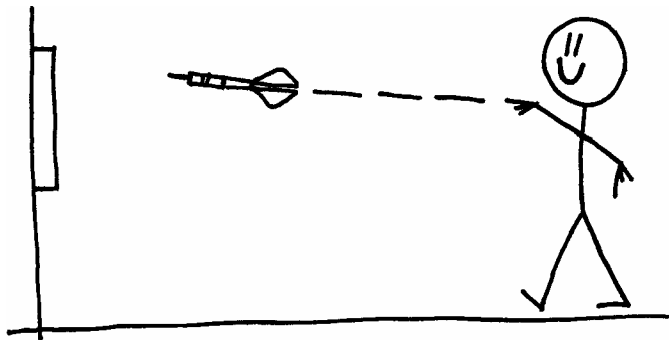
8.

(a) **Function of the flight with annotated sketch to show:**

Flights are the fins or wings found at the back of a dart. They serve to stabilize the dart during flight and are made of various materials.

The flights give the dart stability so that the player can hit the target if aimed correctly. Hard plastic flight tends to stiffen the dart, which is considered desirable. The extra surface area of the flight, which makes the dart significantly more stable in some cases.

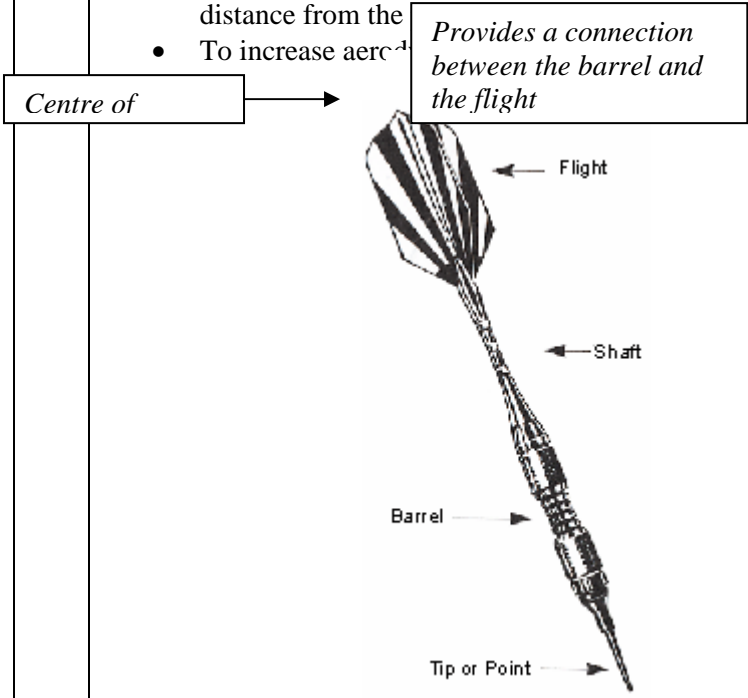
Hard flights do not flex like a soft flight when hit, but do "pop off" the dart. If the flight falls off then the dart becomes unstable and will not hit the target. This is desirable as it reduces the risk of injury.



Annotated sketch (2), sensible notes (1) each
Sketch shows basic function of the flight (1), more detailed information (2)

(b) **Function of the shaft with annotated sketch to show:**

- A physical and interchangeable connection between the barrel and flight.
- To balance the dart – to position the flight at an optimum distance from the
- To increase aerodynamic stability



*Annotated sketch (2), sensible notes (1) each
Sketch shows basic function of the shaft (1), more detailed information (2)*

Question		Expected answers	Mark allocation		
9.	(a)	(i)	Appropriate modern alloy currently in use with darts e.g. Nickel/tungsten alloy (various percentages) Or similar	1 x 1	1
		(ii)	Appropriate explanation of improved characteristics of the barrel of the dart through use of named modern alloy e.g. Tungsten is a very dense material, (1) so darts with a considerable weight can be made quite slim (1) (smaller diameter barrels) making it possible to achieve much tighter possible groups (1) than before, (and the averages in pro games have improved dramatically). Tungsten is very durable (1), so a high-density tungsten dart resists wear (1) and the machined grip will not wear down as rapidly (1) (as on Brass or Nickel/Silver darts). <i>Low response (1) or two low responses (2)</i> <i>Allow follow through where appropriate</i>	1 x 1	2
	(b)	(i)	Appropriate coating commonly used on barrel of dart e.g. titanium/tantalum nitride, titanium carbide.	1 x 1	1
		(ii)	Appropriate reason for use of coating identified in (b) (i) e.g. Increased grip (1) therefore the player has much more control over the release of the dart (1) with sweaty hands Increased durability (1) withstands fair wear and tear from prolonged use (1) <i>Low response (1) two low responses (2)</i> <i>Allow follow through where appropriate</i>	1 x 1 1 x 1 or 1 x 2	2
	(c)	Appropriate explanation of how use of composite materials in the shaft made darts more appealing to the darts player e.g. Composite type shafts, have plastic (nylon) bases that thread into the dart, combined with aluminum or other metal alloy tops that hold the flight. These are excellent shafts, quite durable, and will not vibrate loose as easily as solid aluminum shafts. Generally available with replaceable tops for economy and convenience. <i>Low response (1) or three low responses (3) or detailed response (2) or any combination</i>	1 x 1 1 x 1 or 1 x 1 1 x 2 or 1 x 3	3	
				(9)	

Question		Expected answers	Mark allocation		
10.	(a)	(i)	<p>Production planning</p> <p>Statement must be applicable to the mass produced set of darts, such as:</p> <ul style="list-style-type: none"> • Manufacturing specification (1) planning manufacturing processes (1) • Planning work schedule (1) resources (1) sequence of assembly (1) time plan (1) scheduling production (1) <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 1 x 1 or 1 x 2</p>	2
		(ii)	<p>Materials supply and control</p> <p>Statement must be applicable to the mass produced set of darts, such as:</p> <ul style="list-style-type: none"> • The availability and purchase of suitable materials (metal blanks etc) and components (1) to ensure production can start (1) and continue (1) <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 1 x 1 or 1 x 2</p>	2
		(iii)	<p>Production</p> <p>Statement must be applicable to the mass produced set of darts, such as:</p> <ul style="list-style-type: none"> • CNC lathing (1) knurling (1) drilling (1) internal threading (1) of barrel, injection moulding (1) of nylon shaft, laser cutting (1) of flight etc. <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 1 x 1 or 1 x 2</p>	2
		(iv)	<p>Assembly and finishing -</p> <p>Statement must be applicable to the mass produced set of darts, such as:</p> <ul style="list-style-type: none"> • Tolerance fitting of point into barrel (1) addition of shafts (1) and flights (1) <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	<p>1 x 1 1 x 1 or 1 x 2</p>	2
	(b)	<p>Appropriate advantage to manufacturer of using ICT at production planning stage of darts manufacture e.g.</p> <ul style="list-style-type: none"> • All planning data held in database so available to whole production team • Easy fast access to planning data • Easy access to feedback so can identify where changes necessary • Documents each stage of manufacture so make dart barrel to same standard <p>Or similar</p> <p><i>Low response (1) or three low responses (3) or detailed response (2) or any combination</i></p>	<p>1 x 1 1 x 1 or 1 x 1 1 x 2 or 1 x 3</p>	3	
				(11)	

Question		Expected answers	Mark allocation		
11.	(a)	(i)	Appropriate stage of manufacture e.g. incoming raw materials	1 x 1	1
		(ii)	Appropriate quality check e.g. <ul style="list-style-type: none"> • Weight of alloy • Diameter of blanks <i>Low response (1) or two low responses (2) or detailed response (2)</i> <i>Allow follow through where appropriate</i>	1 x 1 1 x 1 or 1 x 2	2
		(iii)	Appropriate benefits to customer of use of quality control e.g. <ul style="list-style-type: none"> • Made to same quality standard • Reliable product especially when competing • Ergonomically sound and comfortable to use Or similar <i>Low response (1) or two low responses (2) or detailed response (2)</i>	1 x 1 1 x 1 1 x 1 or 1 x 3	3
	(b)	(i)	Appropriate use of computer control at production stage of manufacturing darts e.g. <ul style="list-style-type: none"> • CNC lathe using • CAD data release to manufacturing area/cell • Co-ordinate measuring machine for checking accuracy Or similar	1 x 1	1
		(ii)	Appropriate description of use of computer control at production stage identified in (b) (i) e.g. <ul style="list-style-type: none"> ▪ CAD data for profile of barrel sent to CNC lathe (1), to; ▪ Turn barrel (1), knurl grip (1), drill and tap hole for flight (1) drill hole for point (1) using a range of cutting tools (multi-tool) Or similar <i>Low response (1) or two low responses (2) or detailed response (2)</i> <i>Allow follow through where appropriate</i>	1 x 1 1 x 1 or 1 x 2	2
		(iii)	Appropriate explanation of benefits to manufacturer of this use of computer control e.g. <ul style="list-style-type: none"> • Reduced set up times • Removes need for expensive form tools • Human error and scrap reduced significantly • More predictable manufacturing costs Or similar <i>Low response (1) or three low responses (3) or detailed response (2) or any combination</i> <i>Allow follow through where appropriate</i>	1 x 1 1 x 1 or 1 x 1 1 x 2 or 1 x 3	3
					(12)

Question			Expected answers	Mark allocation	
12.	(a)	(i)	<p>Appropriate example of use of ICT in the marketing stage of manufacturing darts e.g. to:</p> <ul style="list-style-type: none"> Analyse market research data in database about needs of darts players Cost the resource requirements for materials and components in spreadsheet Plan marketing campaign using DTP software <p>Or similar</p>	1 x 1	1
		(ii)	<p>Appropriate benefit to manufacturers of using ICT in marketing stage e.g.</p> <ul style="list-style-type: none"> Speed and accuracy of analysis to establish marketing base Accuracy and flexibility of costing Ability to plan marketing to meet TMG needs/image <p>Or similar</p> <p><i>Low response (1) or two low responses (2) or detailed response (2)</i> <i>Allow follow through where appropriate</i></p>	1 x 1 or 1 x 2	2
	(b)	<p>Appropriate description of use of ICT in packaging and dispatch of darts e.g.</p> <ul style="list-style-type: none"> Electronic monitoring of some packaging processes Use of bar codes to monitor packaging / dispatch of sets of darts Use of PDM software to record, log output of sets of darts <p>Or similar</p> <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	1 x 1 or 1 x 2	2	
	(c)	<p>Appropriate explanation of how use of ICT has made darts appeal to professional darts players e.g.</p> <ul style="list-style-type: none"> Fast time to market of innovative products Use of ICT in market research enables manufacturer to match dart performance to market needs Use of ICT in marketing/advertising enables the darts player to be more aware of darts features/specifications. <p>Or similar</p> <p><i>Low response (1) or two low responses (2) or detailed response (2)</i></p>	1 x 1 or 1 x 2	2	
					(7)

Question		Expected answers	Mark allocation	
13	(a)	<p>Appropriate evaluation of wider impacts of the use of ICT on the design and manufacture of the darts e.g.</p> <p>Use of ICT enables:</p> <ul style="list-style-type: none"> • Import of trend data through electronic links to design office • Design in head office e.g. in developed country • Sending data to client for approval • Electronic communication of manufacturing data to overseas manufacturing facility • Links between business partners in different locations using email, internet, video conferencing • Design in one location and manufacture in another where labour cheaper • Monitoring of quality on production line overseas using digital technology <p>Or similar</p> <p><i>Low response (1) or five low responses (5) or detailed response (2) or any combination</i></p>	<p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>or</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 2</p> <p>or</p> <p>1 x 1</p> <p>1 x 2</p> <p>1 x 2</p>	5
	(b)	<p>Appropriate evaluation of impact of use of modern technologies on the sustainable manufacture of the darts e.g.</p> <p>Use of ICT enables faster time to market of wider range of darts</p> <ul style="list-style-type: none"> • product proliferation causes problems with using up resources, energy • over production causes waste in manufacture, waste to landfill • internet marketing encourages consumerism <p>Or similar</p> <p>Use of modern and smart materials</p> <ul style="list-style-type: none"> • modern alloys and polymers made from finite resources • modern manufacturing processes may cause pollution • marketing of modern/smart materials with appealing characteristics encourages consumerism • problems with recycling alloys • skip and tip disposal of causes land pollution <p>Or similar</p> <p>Use of systems and control technology</p> <ul style="list-style-type: none"> • continuous production increases energy consumption <p>Or similar</p> <p><i>Low response (1) or five low responses (5) or detailed response (2) or any combination</i></p>	<p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>or</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 1</p> <p>1 x 2</p> <p>or</p> <p>1 x 1</p> <p>1 x 2</p> <p>1 x 2</p>	5
				(10)
			Total Marks for	55
			Total Mark	100