

Mark Scheme (Results)

Summer 2012

GCE Design and Technology
Product Design (6GR03)

Paper 01: Design for the Future
(Graphic Products)

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Question Number	Answer	Mark						
1(a)	<p>Any two of the following:</p> <ul style="list-style-type: none"> • Allows correct working height/most comfortable position to be obtained. (1) • Back rest can be altered. (1) • To support the spine/lumber support/back not strained. (1) • Allows user to sit upright/straight. (1) • Allows user to adjust seat to suit their needs. (1) <p style="text-align: right;">(2x1)</p>	(2)						
1(b)	<p>Risk: any one of the following. Use of ergonomics: one justified answer.</p> <table border="1"> <thead> <tr> <th>Equipment</th> <th>Risk</th> <th>Use of ergonomics</th> </tr> </thead> <tbody> <tr> <td>Keyboard</td> <td> <ul style="list-style-type: none"> •Pains/aches in wrist/forearm/hand/shoulder. (1) •RSI. (1) </td> <td> <ul style="list-style-type: none"> • Keyboard at correct height (1) so shoulders can relax. (1) • Keyboard at correct angle (1) so wrists are not flexed. (1) • Arm rests parallel to floor (1) so hands/wrist/forearm at right angle. (1) • Wrist/forearm should be in a neutral position (1) not flexed/over extended. (1) • Keyboard close to user (1) to avoid over reaching/shoulder aches. (1) • Shaped mouse pad/keyboard (1) to fit around hand/wrist. (1) • Gel pad/wrist support/keyboard pad (1) to support the wrist. (1) </td> </tr> </tbody> </table>	Equipment	Risk	Use of ergonomics	Keyboard	<ul style="list-style-type: none"> •Pains/aches in wrist/forearm/hand/shoulder. (1) •RSI. (1) 	<ul style="list-style-type: none"> • Keyboard at correct height (1) so shoulders can relax. (1) • Keyboard at correct angle (1) so wrists are not flexed. (1) • Arm rests parallel to floor (1) so hands/wrist/forearm at right angle. (1) • Wrist/forearm should be in a neutral position (1) not flexed/over extended. (1) • Keyboard close to user (1) to avoid over reaching/shoulder aches. (1) • Shaped mouse pad/keyboard (1) to fit around hand/wrist. (1) • Gel pad/wrist support/keyboard pad (1) to support the wrist. (1) 	
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			<ul style="list-style-type: none"> • Soft touch keyboard (1) reduces pressure on keys (1). 	
	Monitor	<ul style="list-style-type: none"> • Eye strain/headaches/neck pain/shoulder pain (1) 	<ul style="list-style-type: none"> • Screen glare/filter (1) to reduce glare/brightness. (1) • Screens fitted with tilt/swivel (1) to ensure comfortable working position/eye level. (1) • Monitor at right angles to windows (1) to reduce glare/eye strain. (1) • Monitor brightness control (1) to reduce glare/brightness. (1) 	
			(6x1)	(6)
	Total for question			8

Question Number	Answer	Mark												
2(a)	<p>One justified answer:</p> <ul style="list-style-type: none"> • Deliberate shortening of product life (1) by product becoming outdated/product wears out quickly. (1) • Encouraging sales/profits/ for company (1) as customers have to update regularly. (1) • Helps keep the company in business (1) by needing to update /produce new products. (1) <p style="text-align: right;">(2x1)</p>	(2)												
2(b)	<p>One mark for each type of obsolescence and one mark for a correct example.</p> <table border="1"> <thead> <tr> <th>Type of Obsolescence</th> <th>Description</th> <th>Product Example</th> </tr> </thead> <tbody> <tr> <td>Technological</td> <td> <ul style="list-style-type: none"> • Introducing technologically updated products/software. • Advances in technology. • Smaller components. • More powerful components. • New materials. <p style="text-align: right;">(1)</p> </td> <td> <ul style="list-style-type: none"> • Computers • Mobile phones • MP 3/4 players <p style="text-align: right;">(1)</p> </td> </tr> <tr> <td>Style</td> <td> <ul style="list-style-type: none"> • Updating the style of a product. • Fashion changes yearly. • Design/colour changes. • Update shapes in cars. • Outdated/updated fashion/out of fashion. <p style="text-align: right;">(1)</p> </td> <td> <ul style="list-style-type: none"> • Motor cars • Fashions in clothing industry <p style="text-align: right;">(1)</p> </td> </tr> <tr> <td>Physical</td> <td> <ul style="list-style-type: none"> • Design a product with limited lifespan. • Product biodegrades after </td> <td> <ul style="list-style-type: none"> • Light bulbs • Printer ink cartridge </td> </tr> </tbody> </table>	Type of Obsolescence	Description	Product Example	Technological	<ul style="list-style-type: none"> • Introducing technologically updated products/software. • Advances in technology. • Smaller components. • More powerful components. • New materials. <p style="text-align: right;">(1)</p>	<ul style="list-style-type: none"> • Computers • Mobile phones • MP 3/4 players <p style="text-align: right;">(1)</p>	Style	<ul style="list-style-type: none"> • Updating the style of a product. • Fashion changes yearly. • Design/colour changes. • Update shapes in cars. • Outdated/updated fashion/out of fashion. <p style="text-align: right;">(1)</p>	<ul style="list-style-type: none"> • Motor cars • Fashions in clothing industry <p style="text-align: right;">(1)</p>	Physical	<ul style="list-style-type: none"> • Design a product with limited lifespan. • Product biodegrades after 	<ul style="list-style-type: none"> • Light bulbs • Printer ink cartridge 	
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		<p>a time.</p> <ul style="list-style-type: none"> • Throw away items. • Limited durability of product. <p>(1)</p>	<p>s</p> <ul style="list-style-type: none"> • Batteries • Biro's • Toys <p>(1)</p>	
	<p><i>Be aware that further examples may be offered by candidates. The same example cannot be used more than once.</i></p> <p>(6x1)</p>			(6)
Total for question				8

Question Number	Answer	Mark
3(a)	<p>Any three of the following points:</p> <ul style="list-style-type: none"> • High speed/faster connection/more efficient. (1) • Wide bandwidth. (1) • Lets digital data to pass along analogue telephone lines. (1) • Modems at input end convert computer digital data into audible tones. (1) • Modems at output end convert signals back to digital. (1) • Allows for shared use of networks. (1) • Allows telephone & internet use at the same time on later versions/with early versions users had to disconnect. (1) • Can be installed over existing telephone lines. (1) • Lines can be used for voice/data (1) • Broadband is cheaper. (1) • Broadband easier to set up. (1) • Allows easy access to the web. (1) • ISDN is a dial up service (1). <p><i>Be aware of negative side of ISDN statements that may be valid i.e. when running ISDN cuts of the phone line = point 7 so award mark once.</i></p> <p style="text-align: right;">(3x1)</p>	(3)
3(b)	<p>Any five of the following points:</p> <ul style="list-style-type: none"> • Broadband is faster. (1) • Allows for an always on line service. (1) • No need for dialling a number to get connected. (1) • Frees up local land line when on line. (1) • No call up charges when using the internet. (1) • Data does not need to be converted. (1) • Provides two channels on the phone line. (1) • Allows for wireless connections. (1) • Can be used at hotspots. (1) • Allows more than one user to connect. (1) • 3G/4G/satellite/allow it to be used anywhere. (1) • No interference on connection. (1) • Can handle more/large amounts of data.(1) • Allows for more complex software to be used (1). <p style="text-align: right;">(5x1)</p>	(5)
Total for question		8

Question Number	Answer	Mark
4(a)	<p>Two justified answers:</p> <ul style="list-style-type: none"> • CNC machines are more expensive to buy (1) when compared to manually operated machines/increases companies costs. (1) • Once set up CNC machines only need minders (1) which will lead to loss of skills/CNC machine operator only needs basic training to supervise several machines. (1) • Highly skilled workers required (1) to set up/maintain/ repair CNC machines. (1) • Poor job satisfaction/lower productivity (1) employees' loose interest/mindless tasks/little stimulation. (1) • Does not recognise errors/cannot think (1) could result in faulty products. (1) • CAM lacks flexibility (1) that manually operated machines have. (1) • Fewer manual/low skilled workers/needed to run machines (1) leading to higher unemployment/lower labour costs (1) • Computer systems can become corrupted (1) leading to lost work. (1) <p style="text-align: right;">(2x2)</p>	(4)
4(b)	<p>Any four of the following.</p> <ul style="list-style-type: none"> • Integrates all aspects of a manufacturing system (1) • Mention of various areas such as design/analysis/planning/flexible manufacturing/distribution/ordering/JIT. (1) • Electronically organised into a computer integrated system. (1) • Saves time/money in production/cost effective. (1) • Gives direct control/monitoring of all process operations. (1) • Allows information/data in the system to be readily shared by all departments/fast/rapid communication. (1) • Helps maintain consistent product quality/precision/accuracy <i>because of the integration</i>/no human error. (1) • Enables products to be produced in the most efficient time period/can improve productivity. (1) • Brings product to market quicker/reduces lead times. (1) • Allows quick response to changes/demand. (1) • Benefits from being an automated system. (1) 	

	<i>Cheaper must be qualified by integration of system NOT less labour costs.</i>	(4x1)	(4)
	Total for question		8

Question Number	Answer	Mark
5 (a)	Closed loop (1) <i>Only answer</i>	(1)
5(b)	Any three of the following points: <ul style="list-style-type: none"> • Route determined/guided by computers/follows a programmed route. (1) • Lasers/sensors/GPS/transponders/radio waves pick up the route. (1) • Information fed back to the microprocessors. (1) • Microprocessors on vehicle follow the laser route. (1) • Continual adjustments made by the microprocessors. (1) • Lay out pre determined route. (1) Or <ul style="list-style-type: none"> • Route determined/guided by computers/follows a programmed route. (1) • Magnetic navigation system. (1) • Picks up references with sensors in the floor. (1) • Based on magnetic tape/magnetic spots/induction wire. (1) • Buried in the floor. (1) <i>Or a mixture of both systems. Ensure correct context when marking.</i>	(3)
5(c)	Two justified answers: <ul style="list-style-type: none"> • Key people/teams from all departments work together at each stage of the design and manufacturing process (1) reduces product development time. (1) • By overlapping the development process (1) lead times are reduced. (1) • Helps overcome production delays/more efficient (1) which leads to earlier release of new products. (1) • Enables right first time design (1) eliminating need for design changes. (1) • Teamwork (1) leads to product quality improvement/changes in design. (1) • Reduces design to market time/market pull (1) by all departments working together. (1) • Responds to JIT (1) making more room for production area. (1) 	(4)
Total for question		8

Question Number	Answer	Mark
6(a) (i)	<p>Any three from the following.</p> <p>Raw materials</p> <ul style="list-style-type: none"> • Energy needed to extract oil. (1) • Energy needed to refine oil. (1) • Energy needed to convert oil into polymer form. (1) • Environmental impact created by extraction/processing. (1) • Environmental impact on habitat. (1) • Transportation of materials causes pollution. (1) • Atmospheric pollution from extraction/refining. (1) • Uses up non renewable fossil resources. (1) • Adds to global warming. (1) <p><i>Focus on environmental impact of extracting raw materials.</i> <i>Cost is not an issue.</i></p> <p style="text-align: right;">(3x1)</p>	(3)
6(a) (ii)	<p>Any three from the following.</p> <p>Manufacture</p> <ul style="list-style-type: none"> • Energy needed to produce casing. (1) • Create greenhouse gases/global warming. (1) • Toxic pollution/emissions created by making casings. (1) • Any visual/noise environmental impact created (factory buildings/infrastructure). (1) • Any environmental impact on habitats. (1) • Transportation of casings/raw materials. (1) • Waste from manufacturing process to landfill (answers must state the whole phrase). (1) <p><i>Focus on environmental impact of manufacturing the case.</i> <i>Cost is not an issue.</i></p> <p style="text-align: right;">(3x1)</p>	(3)
6(b)	<ul style="list-style-type: none"> • Plastics are non-biodegradable (1) so repair reduces landfill issues. (1) • Fewer products thrown away. (1) reduces/litter/visual/habitat issues. (1) • Reduced raw material extraction for replacement product (1) saves non-renewable resources. (1) • Less processing/manufacturing needed (1) reduces energy consumption. (1) 	

	<ul style="list-style-type: none">• Fewer products manufactured (1) reduces air pollution. (1)• Fewer products made, less transportation (1) reduces carbon footprint. (1) <p style="text-align: right;">(2x1)</p>	(2)
	Total for question	8

Question Number	Answer	Mark
7(a)	<p>Any four of the following points:</p> <ul style="list-style-type: none"> • Companies gauge consumer interest /demand/TMG. (1) • Is it too expensive to produce. (1) • Research/design/development can be very expensive. (1) • Will the product make a profit/will it sell. (1) • Will it affect developing nations unfairly/ Location of factory. (1) • Fair trade issues. (1) • Disposal of waste/taxation. (1) • Cost of materials/use cheaper materials. (1) • Type of manufacturing process used. (1) • Set-up costs/running costs/manufacturing costs/wages/ capital expenditure. (1) <p style="text-align: right;">(4x1)</p>	(4)
7(b)	<p>Any four of the following points:</p> <ul style="list-style-type: none"> • Companies can reach a wide audience/global market/global • Cheaper than advertising via TV/papers/magazines. (1) • Increased company profile on a world wide basis. (1) • Businesses can reach consumers in a medium that brings results quickly. (1) • Greener/saves paper. (1) • Marketers can determine which messages or offerings are more appealing to the audience/cookies/pop ups. (1) • Information/adverts can be updated immediately. (1) • Results of campaigns can be measured/tracked immediately. (1) • Can be aimed at/sent to specific target groups. (1) • Shows detailed knowledge immediately of user preferences/ market trends by tracking sales. (1) • Cost savings due to reduced sales force/need for retail outlets. (1) • Advertising this way has a lower carbon footprint/lower global warming. (1) • Links to related sites easily made. (1) <p style="text-align: right;">(4x1)</p>	(4)
Total for question		

Question Number	Answer	Mark
8	<p><i>(If only one side of argument put forward then a maximum of 5 marks only.) BOTH sides needed for full marks</i></p> <p>Advantages of Nuclear Energy (max 5 points)</p> <ul style="list-style-type: none"> <li>• Nuclear reactions release vast amounts of energy, compared to coal, oil, hydro or wind energy. (1) <li>• No release of carbon dioxide/greenhouse gases at the time of nuclear reaction unlike with fossil fuels. (1) <li>• Nuclear power plants need less fuel than ones which burn fossil fuel. (1) <li>• Technology readily available does not have to be developed first. (1) <li>• A large amount of energy is generated from a very small amount of fuel. (1) <li>• Saves on fossil fuels/non renewable energy source. (1) <li>• Uranium resources are plentiful and pose no constraint on future nuclear power development. (1) <li>• Reliable consistent source of power/ more efficient. (1) <p>Disadvantages of Nuclear Energy (max 5 points)</p> <ul style="list-style-type: none"> <li>• Requires large capital cost to build a nuclear power station. (1) <li>• Nuclear power plants as well as nuclear waste could be preferred targets for terrorist attacks. (1) <li>• Radioactive waste is produced, which can be used for making nuclear weapons. (1) <li>• The time frame needed to plan and build a new nuclear power generation plant is in the range of 20 to 30 years. (1) <li>• Poisonous waste is produced, which is highly radioactive. (1) <li>• Disposal of/storage of radioactive waste a problem. (1) <li>• Careless disposal of waste can lead to pollution of land, rivers and the ocean. (1) <li>• Serious accidents have happened contaminating large areas with radioactivity/public distrust of nuclear power. (1) <li>• Dismantling nuclear power stations/decommissioning very costly. (1) <li>• Nuclear radiation harms the cells of the body which can make people sick or even kill them. (1) <li>• Nuclear reactors only last for about forty to fifty years. (1) <li>• Skilled workers needed to run/design/build power station. (1) <li>• Must be sited near water for cooling. (1) <p style="text-align: right;">(6x1)</p>	(6)
	Total for question	6

Question Number	Answer	Mark
9	<p><i>(If only one side of argument put forward then a maximum of 7 marks only.)</i> <u><i>BOTH sides needed for full marks.</i></u></p> <p>Advantages</p> <ul style="list-style-type: none"> • Able to repeat repetitive tasks. (1) • Can be used in hazardous conditions/Increases safety/lift heavy loads. (1) • Frees human capacity for more challenging tasks. (1) • Quality kept throughout production/high quality output. (1) • Can be easily reprogrammed. (1) • More productive than humans/works faster/increased efficiency. (1) • Cost effective once in operation. (1) • Optimises all available space in warehouse. (1) • Machine has the ability to adapt/think/solve problems itself. (1) • More accurate/removes human error. (1) • Some AI are autonomous/can learn for themselves. (1) <p>Disadvantages</p> <ul style="list-style-type: none"> • Expensive to set up production line program robot. (1) • Limited sensory input compared to humans. (Sight, touch etc). (1) • Some AI only react to inputted data. (1) • Not as flexible as humans. (1) • Expensive to maintain /maintenance issues different brands use different control systems. (1) • Humans must be excluded from robotic operating cells/ safety of humans. (1) • Smaller workforce/higher skilled workforce. (1) • Less need for unskilled labour/reduced labour costs increased unemployment. (1) <p style="text-align: right;">(8x1)</p>	(8)
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