

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

Question Number	Answer	Mark												
<b>2(a)</b>	<p><b>One</b> justified answer:</p> <ul style="list-style-type: none"> <li>• Deliberate shortening of product life (1) by product becoming outdated/product wears out quickly. (1)</li> <li>• Encouraging sales/profits/ for company (1) as customers have to update regularly. (1)</li> <li>• Helps keep the company in business (1) by needing to update /produce new products. (1)</li> </ul> <p style="text-align: right;">(2x1)</p>	(2)												
<b>2(b)</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><b>Technological</b></td> <td> <ul style="list-style-type: none"> <li>• Introducing technologically updated products/software.</li> <li>• Advances in technology.</li> <li>• Smaller components.</li> <li>• More powerful components.</li> <li>• New materials.</li> </ul> <p style="text-align: right;">(1)</p> </td> <td> <ul style="list-style-type: none"> <li>• Computers</li> <li>• Mobile phones</li> <li>• MP 3/4 players</li> </ul> <p style="text-align: right;">(1)</p> </td> </tr> <tr> <td><b>Style</b></td> <td> <ul style="list-style-type: none"> <li>• Updating the style of a product.</li> <li>• Fashion changes yearly.</li> <li>• Design/colour changes.</li> <li>• Update shapes in cars.</li> <li>• Outdated/updated fashion/out of fashion.</li> </ul> <p style="text-align: right;">(1)</p> </td> <td> <ul style="list-style-type: none"> <li>• Motor cars</li> <li>• Fashions in clothing industry</li> </ul> <p style="text-align: right;">(1)</p> </td> </tr> <tr> <td><b>Physical</b></td> <td> <ul style="list-style-type: none"> <li>• Design a product with limited lifespan.</li> <li>• Product biodegrades after</li> </ul> </td> <td> <ul style="list-style-type: none"> <li>• Light bulbs</li> <li>• Printer ink cartridge</li> </ul> </td> </tr> </tbody> </table>	Type of Obsolescence	Description	Product Example	<b>Technological</b>	<ul style="list-style-type: none"> <li>• Introducing technologically updated products/software.</li> <li>• Advances in technology.</li> <li>• Smaller components.</li> <li>• More powerful components.</li> <li>• New materials.</li> </ul> <p style="text-align: right;">(1)</p>	<ul style="list-style-type: none"> <li>• Computers</li> <li>• Mobile phones</li> <li>• MP 3/4 players</li> </ul> <p style="text-align: right;">(1)</p>	<b>Style</b>	<ul style="list-style-type: none"> <li>• Updating the style of a product.</li> <li>• Fashion changes yearly.</li> <li>• Design/colour changes.</li> <li>• Update shapes in cars.</li> <li>• Outdated/updated fashion/out of fashion.</li> </ul> <p style="text-align: right;">(1)</p>	<ul style="list-style-type: none"> <li>• Motor cars</li> <li>• Fashions in clothing industry</li> </ul> <p style="text-align: right;">(1)</p>	<b>Physical</b>	<ul style="list-style-type: none"> <li>• Design a product with limited lifespan.</li> <li>• Product biodegrades after</li> </ul>	<ul style="list-style-type: none"> <li>• Light bulbs</li> <li>• Printer ink cartridge</li> </ul>	
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		<p>a time.</p> <ul style="list-style-type: none"> <li>• Throw away items.</li> <li>• Limited durability of product.</li> </ul> <p>(1)</p>	<p>s</p> <ul style="list-style-type: none"> <li>• Batteries</li> <li>• Biro</li> <li>• Toys</li> </ul> <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)
<b>Total for question</b>				<b>8</b>

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

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



	<i>Cheaper must be qualified by integration of system NOT less labour costs.</i>  <p style="text-align: right;">(4x1)</p>	(4)
	<b>Total for question</b>	<b>8</b>

Question Number	Answer	Mark
5 (a)	Closed loop (1) <i>Only answer</i>	(1)
5(b)	<p>Any <b>three</b> of the following points:</p> <ul style="list-style-type: none"> <li>• Route determined/guided by computers/follows a programmed route. (1)</li> <li>• Lasers/sensors/GPS/transponders/radio waves pick up the route. (1)</li> <li>• Information fed back to the microprocessors. (1)</li> <li>• Microprocessors on vehicle follow the laser route. (1)</li> <li>• Continual adjustments made by the microprocessors. (1)</li> <li>• Lay out pre determined route. (1)</li> </ul> <p>Or</p> <ul style="list-style-type: none"> <li>• Route determined/guided by computers/follows a programmed route. (1)</li> <li>• Magnetic navigation system. (1)</li> <li>• Picks up references with sensors in the floor. (1)</li> <li>• Based on magnetic tape/magnetic spots/induction wire. (1)</li> <li>• Buried in the floor. (1)</li> </ul> <p><i>Or a mixture of both systems. Ensure correct context when marking.</i></p> <p style="text-align: right;">(3x1)</p>	(3)
5(c)	<p><b>Two</b> justified answers:</p> <ul style="list-style-type: none"> <li>• Key people/teams from all departments work together at each stage of the design and manufacturing process (1) reduces product development time. (1)</li> <li>• By overlapping the development process (1) lead times are reduced. (1)</li> <li>• Helps overcome production delays/more efficient (1) which leads to earlier release of new products. (1)</li> <li>• Enables right first time design (1) eliminating need for design changes. (1)</li> <li>• Teamwork (1) leads to product quality improvement/changes in design. (1)</li> <li>• Reduces design to market time/market pull (1) by all departments working together. (1)</li> <li>• Responds to JIT (1) making more room for production area. (1)</li> </ul> <p style="text-align: right;">(2x2)</p>	(4)
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Question Number	Answer	Mark
<b>6(a) (i)</b>	<p>Any <b>three</b> from the following.</p> <p><b>Raw materials</b></p> <ul style="list-style-type: none"> <li>• Energy needed to extract oil. (1)</li> <li>• Energy needed to refine oil. (1)</li> <li>• Energy needed to convert oil into polymer form. (1)</li> <li>• Environmental impact created by extraction/processing. (1)</li> <li>• Environmental impact on habitat. (1)</li> <li>• Transportation of materials causes pollution. (1)</li> <li>• Atmospheric pollution from extraction/refining. (1)</li> <li>• Uses up non renewable fossil resources. (1)</li> <li>• Adds to global warming. (1)</li> </ul> <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)
<b>6(a) (ii)</b>	<p>Any <b>three</b> from the following.</p> <p><b>Manufacture</b></p> <ul style="list-style-type: none"> <li>• Energy needed to produce casing. (1)</li> <li>• Create greenhouse gases/global warming. (1)</li> <li>• Toxic pollution/emissions created by making casings. (1)</li> <li>• Any visual/noise environmental impact created (factory buildings/infrastructure). (1)</li> <li>• Any environmental impact on habitats. (1)</li> <li>• Transportation of casings/raw materials. (1)</li> <li>• Waste from manufacturing process to landfill (answers must state the whole phrase). (1)</li> </ul> <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)
<b>6(b)</b>	<ul style="list-style-type: none"> <li>• Plastics are non-biodegradable (1) so repair reduces landfill issues. (1)</li> <li>• Fewer products thrown away. (1) reduces/litter/visual/habitat issues. (1)</li> <li>• Reduced raw material extraction for replacement product (1) saves non-renewable resources. (1)</li> <li>• Less processing/manufacturing needed (1) reduces energy consumption. (1)</li> </ul>	

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

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

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

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

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