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Mark Scheme (Results)

June 2011

GCE Design and Technology:
Product Design (6GR03).

Paper 01: Designing for the Future
(Graphic Products).

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1		**(6)**

Type of carrier Bag	Advantage	Disadvantage
Paper carrier bag	• Breaks down easily/ biodegradable. **(1)** • Can be recycled. **(1)** • Uses recycled paper. **(1)** • Uses renewable/ sustainable sources. **(1)** **(BOX 1a)** **(1)**	• Take more energy to produce. **(1)** • Creates more pollution due to energy used. **(1)** • Trees must be cut down. **(1)** • Not very durable/ hard to reuse. **(1)** **(BOX 1b)** **(1)**
Plastic carrier bag	• Can be reused. **(1)** • Does not disintegrate when wet. **(1)** • Durable. **(1)** **(BOX 1c)** **(1)**	• Does not decompose easily /creates litter. **(1)** • Difficult to recycle. **(1)** • Uses finite earth resources/oil. **(1)** • Danger to wildlife. **(1)** • Fills up landfill sites. **(1)** • Pollution caused through extraction/manufacture. **(1)** **(BOX 1d)** **(1)**
Eco friendly carrier bag	• Breaks down quickly/biodegradable. **(1)** • Can be recycled/ reused. **(1)** • Made from readily available organic materials. **(1)** **(BOX 1e)** **(1)**	• Limited lifespan. **(1)** • Land now used for growing food reduced. **(1)** • Recycling use a lot of energy/creates emissions. **(1)** **(BOX 1f)** **(1)**

	Total for question	**6**

Question Number	Answer	Mark
2(a)	Any four of the following points to gain marks. **Advantages** • Reduction of Lignin in trees**. (1)** • Reduction of chemicals used**. (1)** • Less toxic chemicals needed**. (1)** • Increased growth rate of trees/higher yields of timber**.** (**1)** • Trees can be grown with specific properties for paper/board industry/ trees can be grown with a specific pigment or colour**. (1)** • Enzymes break down timber fibres more efficiently**. (1)** • Paper fibres can be more effectively bonded/stronger paper**. (1)** • Paper treated to biodegrade more easily/quicker**. (1)** • Increased resistance to disease/rot/insect infestation**. (1)** (4x1)	**(4)**
2(b)	Any six of the following points to gain marks. • Creates micro-climate changes/change of climate/global warming**.(1)** • Loss of: - biodiversity/eco systems/wildlife/extinction of species/ habitat**. (1)** • Food chain reduced/affected for wildlife**. (1)** • Deforestation affects the carbon cycle/more CO2 in atmosphere**. (1)** • Trees absorb carbon dioxide from/release oxygen into the atmosphere**. (1)** • When trees are burnt carbon dioxide released into the atmosphere. **(1)** • Carbon sinks created**. (1)** • Increase in the greenhouse affect/increase greenhouse gasses**. (1)** • Trees draw water through their roots & then release it into the atmosphere**. (1)** • Fewer trees means less water is released causing a drier climate**. (1)** • Without the tree roots soil is washed away/eroded/landslides**. (1)** • Loss of nutrients in the soil**. (1)** • Water courses silt up/rivers flooding**. (1)** • Rising sea levels**. (1)** • Use of heavy machinery/cutting equipment/logging industry causes pollution**. (1)** **(6x1)**	**(6)**
	Total for question	**10**

Question Number	Answer	Mark
3(a)	Any **five** of the following points to gain marks. • Large quantities/plentiful supply of coal readily available**. (1)** • Power stations can be built close to mines/used on the spot unlike wind farms**. (1)** • Gives nations independence from/would be self sufficient in energy production**. (1)** • Can provide a lot of energy/heat when burnt**. (1)** • Does not require processing once mined**. (1)** • Safer than nuclear**. (1)** • Coal can be relatively inexpensive compared to other energy sources. **(1)** • Burning coal can produce useful by-products that can be used for other industries or products/steam can be recovered for local heating**. (1)** • Coal is reliable/stable source of energy/not dependent on the weather**. (1)** • Easy/safe to handle/safe to store**. (1)** • Easy to transport/infrastructure already available**. (1)** • Can be used to provide heat in the home**. (1)** **(5x1)**	**(5)**
3(b)	Any **five** of the following points to gain marks. • Weather influences output/reliability/no sun, no power**. (1)** • Back up system/battery needed for night time use**. (1)** • Output has to be converted to AC**. (1)** • Solar power is inefficient/low limited power source**. (1)** • Solar panels are expensive to produce/install**. (1)** • Maintenance expensive/skilled technicians needed to maintain/ repair equipment**. (1)** • Affected by pollution making panels dirty/panels must be kept clean**. (1)** • Large area needed for effective energy source**. (1)** • Expensive when compared to other alternative energy sources**. (1)** • Visual eye sore/large areas, panels needed**. (1)** • Positioning/orientation important/cannot be put anywhere**. (1)** **(5x1)**	**(5)**
3(c)	Any **two** of the following points to gain marks**.** *Must relate to renewable energy projects***.** • To help develop/encourage renewable energy projects**. (1)** • Provides financial support to renewable energy projects**. (1)** • Government orders involvement to encourage renewable sources**. (1)** • Electricity distribution companies must buy electricity from renewable sources**. (1)** • Aim to reduce dependence on fossil fuels/increase use of renewable sources**. (1)** • It is to help the development of renewable energy projects**. (1)** **(2x1)**	**(2)**
	Total for question	**12**

Question Number	Answer	Mark
4(a)	Any **three** of the following points to gain marks. This is about the affect on employment. • Reduction in low skilled jobs/untrained workforce. **(1)** • Increase in the need for skilled workforce. **(1)** • Need for highly computer literate workforce. **(1)** • Greater need for a more flexible workforce. **(1)** • Workforce needs to be multi skilled/multi disciplinary **(1)** • Effects on workforce morale. **(1)** **(3x1)**	**(3)**
Question Number	Answer	Mark
4(b)	Any **six** of the following points to gain marks. • Lean manufacturing is achieved by reducing waste/non value activities at all stages of manufacturing. **(1)** • Computerised/automated system helps ordering / reduces costs / staffing. **(1)** • There is no "fat" in the system. **(1)** • This achieved by reducing storage space. **(1)** • Only buys stock when an order is received keeping stock levels low/no stockpiling. **(1)** • No over production /only produces the amount needed. **(1)** • Materials arrive at the factory JIT for them to be processed. **(1)** • Once manufactured goods sent straight from the factory. **(1)** • Q.C. ensures no wastage occurs through faulty goods. **(1)** • Manufacturing staff must be multi skilled. **(1)** • Staff prepared to be used anywhere in the production system. **(1)** • It works best with single piece production in continuous flow work cells. **(1)** • Very quick change over when a new product is to be made is expected /reduced lead time. **(1)** • Relies on "pull" of customer demand. **(1)** • Relies on good communications throughout the system. **(1)** • Manufacturer – supplier relationship important. **(1)** • Allows the company to respond quickly to changing market demands/be flexible. **(1)** • Funds are not tied up in stock which improves cash flow. **(1)** (6x1)	**(6)**
	Total for question	**9**

Question Number	Answer	Mark
5(a)	Any **three** of the following points to gain marks. • EDI can save companies money/more efficient. **(1)** • No limit on size of documents. **(1)** • Secure method of transferring information. **(1)** • Data translated into a common format between sites/companies. **(1)** • More reliable than e-mail. **(1)** • Limits the amount of human interaction. **(1)** • Use of data from the exchange reduces the handling costs of sorting/ distributing/organising/searching for paper documents. **(1)** • EDI reduces the chances of transcription error. **(1)** • Information handling is greatly reduced. **(1)** • Creates a paperless company. **(1)** **(3x1)**	**(3)**

Question Number	Answer	Mark
5(b)	<u>Laser object modelling</u> (LOM) • Design created using CAD. **(1)** • Information sent /encoded to machine. **(1)** • The object is built up of layers. **(1)** • Layers no more than 0.75mm. **(1)** • Can be copied in schools. **(1)** • layers of paper cut out. **(1)** • Using a vinyl cutter/laser cutter. (**1)** • Each layer attached to previous layer. **(1)** <u>Stereo lithography</u> • Design created using CAD. **(1)** • Information sent/encoded to machine. **(1)** • Lasers used. **(1)** • Built up in layers. **(1)** • Liquid polymers/starch/resin/plastic granules. **(1)**. • Material is set/hardened/cured. **(1)** • Where beams intersect. **(1)** • Lowered after each pass. **(1)** • Arm moves across top surface after each layer to ensure top surface is flat. **(1)** <u>Solid ground curing</u> • Design created using CAD. **(1)** • Information sent/encoded to machine. **(1)** • A vat moves horizontally. **(1)** • Bed lowered after each pass. **(1)**. • A uv lamp (mercury light) instead of a laser, is used. **(1)** • This floods the chamber. **(1)** • Solidify the entire layer at once. **(1)** <u>Selective laser sintering (sls)</u> • Design created using CAD. **(1)** • Information sent/encoded to machine. **(1)** • Powders of different materials/metal/ceramic powders/polymers are used. **(1)** • The laser hits on selected areas. **(1)** • Laser fuses powders/Sintering. **(1)** • Making the particles melt and solidify. **(1)** • Powder bed lowered by one layer thickness after each pass. **(1)** **(5x1)**	**(5)**
	Total for question	**8**

Question Number	Answer	Mark
6(a)	Any **four** of the following points to gain marks from **only one movement**. **<u>Art Deco</u>** • Took in hand crafted and machine manufacture. **(1)** • Has an opulent style. **(1)** • Influenced by cubist paintings of Picasso & Braque. **(1)** • Primitive art forms African/Aztec/Egyptian art used. **(1)** • Used geometric/symmetrical/simple shapes, zig zag patterns/ chevrons/sunbursts. **(1)** • Bright colours used. **(1)** • Designs strong/bold shapes/sharp edges. **(1)** • Style based on smooth shapes. **(1)** • Used in jewellery/buildings/perfume bottles/radios. **(1)** • Expensive/exotic materials/enamel/ivory/polished stone/chrome used. **(1)** • Art Deco designs to be made at low cost through mass production**.** **(1)** **<u>Art Nouveau</u>** • Flowing/wavy/sweeping/curly/whiplash lines. **(1)** • Based on the style of nature/natural forms. **(1)** • Stylised climbing plants/insects/flowers/female form. **(1)** • Decorative/personalised/handcrafted style. **(1)** • Celtic/Arabian/Japanese/ancient Greek patterns gave inspiration. **(1)** • Used modern materials/glass and wrought iron. **(1)** • Used in architecture, glass, jewellery, fabrics & wallpaper. **(1)** **(4x1)**	**(4)**
6(b)	Any **five** of the following points to gain marks. • Much of Loewy's work merged Art Deco style with producing streamlined forms. **(1)** • The shapes looked modern/futuristic/used the tear drop shape. **(1)** • Success came from improving/enhancing the appearance/aesthetics of products. **(1)** • His work put industrial design in the spotlight / modernised industrial design. **(1)** • Worked on company identities for multinational companies. **(1)** • Spent time streamlining a broad range of items. **(1)** • Many of his designs are still in use today. **(1)** • Used streamlining to shape/smooth vehicles aerodynamically i.e. (slanted windshield/built in headlights). **(1)** • Streamlining allowed for greater efficiency/speed/reduce drag.**(1)** • Streamlining improved the style/appearance/aesthetics of items. **(1)** **(5x1)**	**(5)**
	Total for question	**9**

Question Number	Answer	Mark
7(a)	This is mix and match. As long as the first statement (the what) is supported by the second statement (the how or why) two marks can be awarded. • Streamlining allows air to pass over the shape of the vehicle **(1)** without causing disturbances. **(1)** • Allows the car to pass through the air **(1)** with less friction. **(1)** • It is pointed **(1)** so it passes through the air more efficiently. **(1)** • Less fuel is used **(1)** to overcome air resistance. **(1)** **(2x1)**	**(2)**
7(b)	Answer must include both form and function for maximum marks. Maximum **three** marks in total for each car. **Figure 1** • Has many practical uses/a workhorse/functional. **(1)** • Rugged design/strong. (1) • Some see this type of vehicle offensive as a gas guzzler/Chelsea tractor/size. **(1)** • Can carry many passengers and luggage. **(1)** • High/good ground clearance. **(1)** • Function over form. **(1)** • Has good carrying capacity. **(1)** • Is a go anywhere vehicle/off road capability. **(1)** **Figure 2** • Form over function. **(1)** • Built for speed/'sporty'. **(1)** • Aerodynamic form/streamlined/sleek flowing lines/smooth/ stylish/cool. **(1)** • Form allows for few practical uses. **(1)** • Low ground clearance. **(1)** • Limited functional vehicle with few uses. **(1)** • Has very limited seating capacity. **(1)** • Has very limited carrying capacity. **(1)** • Limited to use on tarmac roads. **(1)** **(3x1 & 3x1)**	**(3)** **(3)**
	Total for question	**8**

Question Number	Answer	Mark
8(a)	A well balanced argument is expected here involving both advantages and disadvantages. Responses can be in bullet form BUT not as simple statements. Below are guidelines, fuller responses are expected. **ADVANTAGES – Max 7 marks** • Can work to very tight tolerances/more accurate. **(1)** • Robots do not need wages/paying. **(1)** • Fewer workers needed/lower labour costs. **(1)** • They work faster than humans/more efficient eliminates human error/ more reliable than humans. **(1)** • Can do highly repetitive work. **(1)** • They do not need breaks unlike humans/can work 24/7/increased productivity. **(1)** • Many robotic arms have built in sensors which can automatically adjust the output to ensure that it works in tolerance. **(1)** • Can work in areas not safe for humans/lift heavy loads. **(1)** • Should errors occur that it cannot correct it will shut down in a fail safe situation due to sensors on the system. **(1)** • Once programmed for a variety of tasks it is relatively simple to change the output/easily reprogrammed. **(1)** • Suitable for both batch and long run production. **(1)** **DISADVANTAGES – Max 7 marks** • High initial costs to purchase. **(1)** • High initial costs to setup the manufacturing line.**(1)** • Can be expensive to repair if they breakdown/production is lost if there is a breakdown. **(1)** • Need highly skilled workers to maintain them. **(1)** • Few workers needed to look after them hence higher unemployment. **(1)** • Not as flexible/able to improvise like humans/cannot learn on the job. **(1)** • Malfunction/cannot make decisions/correct errors/big effect on production. **(1)** • Cannot think for itself/cannot sense dangers. **(1)** *(If only one side of argument put forward then a maximum of 7 marks only.)* **(8x1)**	**(8)**
	Total for question	**8**

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