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Mark Scheme (Results)

Summer 2013

GCE Design & Technology Product Design
Graphic Products (6GR03)

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Question Number	Answer	Mark
1(a)	A response that identifies any of **four** of the following. No single word answers • use as few different materials as possible **(1)** • make components easy to separate **(1)** • label and mark polymers for correct sorting **(1)** • labelling of other materials / printed recycling information **(1)** • avoid surface treatments **/** laminating/adhesives which can prevent recycling**(1)** • use recycled materials as opposed to virgin materials **(1)** • make all/part of packaging recyclable **(1)** • make aspects of the packaging recoverable for future use **(1)** • use of materials (including GM materials) that are recyclable **(1)** • use of materials that are easier to recycle / use less energy to recycle **(1)** • avoid use of non-recyclable material **(1)** **(4 x 1)**	**(4)**
1(b)	A response that identifies any **four** of the following marking points. • consumer feeling they are "doing their bit for the environment" **(1)** • home reuse can lead to reduced transport costs**(1)** • reduced land fill **/** waste disposal **(1)** • less virgin raw material use during product manufacture **(1)** • better economy for consumers and/or manufacturers (refills cost less than original) **(1)** • reduction in refill packaging size assists storage/transport **/** materials usage**(1)** • minimises extraction of non-renewable raw materials **(1)** • reduces energy use for recycling/waste disposal **(1)** • reduced pollution/energy use/CO2 emissions from manufacturing & transporting further bottles **(1)** • gives the company/manufacturer/retailer a 'green' image / improves company image **(1)** • attracts more customers **(1)** • high quality packaging less likely to be damaged in transit **(1)** **(4x1)**	**(4)**

1(c)	Justified responses only: **Do not accept biodegrade** **Advantages** • Fully renewable source **(1)**/doesn't use fossil fuels or finite resources so morally and ethically sound **(1)** • Produced from organic material **(1)** so does not contribute to use of non renewable resources **(1)** • Full decomposition achieved **(1)** so Reduction of time in landfill **(1)** • Is waterproof **(1)** so can be used for multiple applications/ suitable for holding liquids **(1)** • Less harmful effects on environment than other polymers **(1)** due to speed of decomposition **(1)** • Fully degradable in suitable conditions **(1)** so prevents landfill from filling up **(1)** • Degrades quickly **(1)** when no oxygen is present **(1)** • Once polymer produced from organic material can be formed using existing plastic forming machines **(1)** so manufacture can occur in existing plastic forming plants **(1)** • Can be composted **(1)** will be broken down by micro-organisms **(1)** **Disadvantages** • May not be energy efficient at present in production of the polymer **(1)** so will still contribute to global warming **(1)** • is still expensive to produce **(1)** so not widely produced to achieve economies of scale **(1)** • damages other polymers **(1)** when inappropriately recycled/mixed with other polymers **(1)** • Carbon dioxide still generated on decomposition **(1)** so still contribute to global warming **(1)** • Could lead to mono cultures **(1)** to detriment of food crops **(1)** • Not widely available in present day market **(1)** is not cost effective **(2x1) + (2x1) + (2x1)**	**(6)**
	Total for question	**14**

Question Number	Answer	Mark
2(a)	A response that identifies any **four** of the following marking points. • electronic link enables designers work as individuals or in teams **(1)** • electronic libraries available for components **(1)** • can allow experienced designer short lead times / speeds up the design process **(1)** • can allow experienced designer high quality/complexity **(1)** • allows for greater control over designs **(1)** • allows editing and modification **(1)** • allows quick feedback to clients **(1)** • interrelated software means one designer to do multi tasks **(1)** • allows designer access to wide use of tools/editing/templates/copying/pasting **(1)** • allows manipulation of drawings/views/angles/scales **(1)** • allows virtual testing/analysis of components **(1)** • allows 3D simulations / virtual modelling / visualisations **(1)** • designs can be rendered / simulated in use **(1)** • can allow accurate intricate designs to be created quickly/by typing in or direct input of dimensions **(1)** • can link to rapid prototyping as part of design development / feedback to client / testing of design **(1)** • Allows design files to be sent to consultants or clients via email for feedback **(1)** • Not restricted by paper size **(1)**	**(4)**
2(b)	Justified responses: • Products can be scanned at the checkout by retail assistant/customer **(1)** so waiting/queue times are reduced **(1)** • Allows monitoring of product sales **(1)** for analysis to be able to react to consumer demand/ marketing decisions **(1)** • Product data at the checkout **(1)** can be linked to central computer for accounting/financial analysis **(1)** • Unique product bar code **(1)** can be used for stock taking **(1)** • Reduces in store employee time checking items/changing prices **(1)** as links to centralised computer can do this automatically **(1)** • Centralised stock data from sales **(1)** can be used for re-ordering of products to prevent over ordering (JIT ordering) **(1)** • Assists stock control **(1)** as sales trends can be monitored **(1)** **(2x1) + (2x1)**	**(4)**

2(c)	A response that identifies any **four** of the following marking points. • performer wears motion capture suit with markers **(1)** so the computer software can track movement **(1)** • computer software records angles/positions/speeds of movement **(1)** and stores accurate digital representation **(1)** • digital movements can be applied to computer generated images **(1)** for natural movement in a new character **(1)** • motion capture effects can be used with other CGI effects **(1)** so film-making can be achieved in impossible situations **(1)** • markers are placed on actor's joints **(1)** which are used to create a computerised skeleton / wireframe / used to conduct a computer analysis of the movement **(1)** **(4x1)**	**(4)**
	Total for question	**12**

Question Number	Answer	Mark
3a	A response that identifies any three of the following marking points. Candidate responses must be relevant to Smart Glass in order to get credit for any of the below; for e.g do not accept answers relating to Photochromic glass. • Provides shade from harmful UV rays reduce glare **(1)** • Glass can change opacity properties / tint the window (by the application of electric input) **(1)** • Provides privacy when made opaque **(1)** • Can be used for energy saving windows to prevent heat passing **(1)** • can reduce secondary greenhouse emissions through excessive heating/a-c **(1)** • can be used for advertising/promotion/gimmick **(1)** • eliminates need to blinds/curtains **(1)** • reduces gold fish bowl effect in/out side **(1)** • Allows control of natural light levels **(1)** **(3x1)**	**(3)**

3b	A response that identifies any three of the following marking points. • craftsman have been replaced by lower skilled workers / de-skilling of the workforce **(1)** • reduction in workforce numbers / increased unemployment **(1)** • unemployment enforced when mass production taken on **(1)** • no full employment hierarchy (ie only high skilled and low skill) **(1)** • low skill work leads to lower pay **(1)** • social consequences due to lower paid work or unemployment **(1)** • low job satisfaction/morale / work is repetitive / mundane / boring/ tedious **(1)** • increased automation/robotics reduces employment **(1)** • small number of highly skilled technicians/engineers needed to service and maintain production machinery **(1)** **(3x1)**	**(3)**
	Total for question	**6**

Question Number	Answer	Mark
4(a)	A response that identifies any four of the following marking points. For max marks must have both advantages and disadvantages. max 3 if only one side present. The focus is on advantages and disadvantages to the developing country **not** to the multinational company. **Advantage (max three)** • economic regeneration in local area / country **(1)** • improvement to standards of living **(1)** • infrastructure improvements / regeneration for local area **(1)** • additional currency/widening economic base **(1)** • adds economic stability/improves balance of payments **(1)** • transfer of technology**/** new methods or technologies may be brought in by the multinationals**(1)** • increase in employment **(1)** • development of workforce skills **(1)** • improved education and training **(1)** • the multinational may bring improved health & safety standards **(1)** **Disadvantages (max three)** • Development of land can cause damage to the natural environment, eg. Biodiversity and animal habitats **(1)** • The existing built environment may be demolished to make way for factory development. **(1)** • jobs may only be low level/non skilled/low paid **(1)** • profits may returned to developed country/ not developing **(1)** • corners may be cut on H&S **(1)** • goods may be too expensive for local market **(1)** • automation may not lead to high local employment **(1)** • investors can pull out leaving negative effects **(1)** • health and safety legislation may be weak **(1)** • Pollution creates an adverse effect on environment / ecosystems / CO2 production / greenhouse gas production **(1)** • existing infrastructure may not be able to cope with increased demands **(1)**	

	• workers may be taken from traditional trades that will then suffer **(1)** • potential exploitation of workforce **(1)** • potential inflationary pressures brought about by improvements to economy **(1)** **(4x1)**	**(4)**

4(b)	Points discussed: Candidates can still achieve a maximum of 4 marks by discussing only the negatives or only the positives **Pros** • produces low cost power **(1)** • low/no fuel cost and low maintenance costs **(1)** • flexible power source **(1)** • Available for local power supply/link to national grid **(1)** • The wind is free **(1)** • An efficient method of producing energy given the right conditions **(1)** • Does not cause green house gases or other pollutants **(1)** • Allows companies the moral/ethical 'green' credentials **(1)** • Gives them excellent marketing platform **(1)** • Short energy payback period **(1)** • Can be onshore / offshore **(1)** • Wind farms set up in prime locations / unsheltered / exposed areas **(1)** • Reduces the carbon footprint of energy production **(1)** • Considered to be an environmentally friendly / renewable / sustainable / green form of energy **(1)** • Reduces the depletion of fossil fuel reserves / demand for non-renewable power**(1)** • Individual installations reduce bills **(1)** • 'Feed-in' tariff allows individuals to sell power back to the national grid **(1)** • Coastal locations are a good source of strong winds **(1)** • Provides energy for isolated locations away from the national grid **(1)** • **UK** is a prime location for strong winds **(1)** **Cons** • Can only provide small proportion of required energy **(1)** • wind is not constant **(1)** • Can be noisy **(1)** • Visually unsightly **(1)** • Manufacturing costs/set up costs are high **(1)** • Injury to birds in flight **(1)** • Planning consents / objections / pressure groups may delay / reduce or prevent the development of wind farms **(1)** • Wind turbines have high embodied energy (a lot of energy is used in the production of wind turbines) **(1)** • Infrastructure required for power distribution and maintenance damages the natural environment **(1)** **(4x1)**	**(4)**

4(c)	A response that identifies any six of the following marking points. For max marks must have both advantages and disadvantages. max 5 if only one side present. Answers must relate to use of alternative fuels by the distribution company. **Pros (max five)** • power from fuel comparable to diesel **(1)** • renewable fuel source (hydrogen, bio-ethanol) **(1)** • Taxation reductions/low fuel duty/low road tax **(1)** • Avoids congestion charge **(1)** • conversions readily available/relatively inexpensive **(1)** • good reliability as technology improves **(1)** • reduces company's carbon footprint **(1)** • can be use of electric vehicles **(1)** • good PR adds to corporate image / reputation **(1)** • bio-fuel is efficient **(1)** • alternative fuels can be cost-effective **(1)** **Cons (max five)** • not available for fitting to all vehicles/limiting model choice **(1)** • not available as factory fit options (at the moment) **(1)** • running costs not sufficiently low **(1)** • poor availability of fuel/recharging points **(1)** • fuel costs can be high **(1)** • cost of vehicle conversion **(1)** • special fuel tanks are needed **(1)** • LPG tanks are expensive **(1)** • Electric vehicles have a limited range **(1)** • Time required to charge electric vehicles **(1)** • Electricity could come from polluting power stations that burn fossil fuels **(1)** • Safety issues surrounding the storage of hydrogen **(1)** **(6x1)**	**(6)**
	Total for question	**14**

Question Number	Answer	Mark
5 (a) QWC	A response that identifies any four of the following marking points. **CHARLES RENNIE MACKINTOSH** • contrast between strong right angles/parallel lines **(1)** • floral inspired motifs **(1)** • use of symmetry in design **(1)** • heavily influenced by natural **(1)** • stylised flowers/seed pods **(1)** • elongated lines **(1)** • influenced by celtic, ancient Greek, Arabian & ribbon patterns **(1)** • old traditional furniture/shapes sit alongside new ideas **(1)** • form over function – the form is more important than the practicalities **(1)** • embraced the benefits of mass production **(1)** • influence of the female form **(1)** • wavy lines / whiplash / languid lines **(1)** • elegant / intricate **(1)** • influence of other cultures / Japan **(1)** • use of the colour white **(1)** • embraces the aesthetic possibilities of new materials **(1)** *Reference to the picture and the design in the picture may be made when linked to the principles of the design movement.* **(4x1)**	**(4)**
5 (b)	**PHILLIPE STARCK** • design is often stylised/streamlined **(1)** • use of organic shapes and flowing lines to contrast with angular shapes **(1)** • use of pure/clean design **(1)** • clean and uncluttered design based around "less is more"/minimalist **(1)** • unusual combinations of materials **(1)** • strong relationship with user and function of the products **(1)** • futuristic designs **(1)** • style includes fun / humour **(1)** • bright and colourful / abstract use of colour **(1)** • retro re-invented **(1)** • taste for innovation **(1)** • emphasis on form **(1)** • Use of geometric shapes **(1)** • Distinct personality/individualism **(1)** • Use of modern material **(1)** • Often uses a small range of materials **(1)** *Reference to the picture and the design in the picture may be made when linked to the principles of the design movement* **(4x1)**	**(4)**
	Total for question	**8**

Question Number	Answer	Mark
6(a)	A response that identifies any four of the following marking points. There must be both sides of the argument: points for and points against . **For** • Less time spent on Quality Control checks. Therefore the process will continue without interference **(1)** • Basic system **(1)** • System is simple/low cost **(1)** • Suitable for simple tasks **(1)** • Suitable for processes where no decisions are necessary **(1)** **Against** • There are no detection of errors/faults **(1)** • Errors/faults may be repeated **(1)** • There are is no performance tracking points just processes **(1)** • No quality control checks **(1)** • There is no feedback loops for improved quality **(1)** • Does not allow for changes to be made **(1)** • No opportunities for decisions **(1)** **(4x1)**	**(4)**
6(b)	A response that identifies any four of the following marking points • Management of data as it passes from the design to manufacture **(1)** • Data includes plans/models/CAD drawings/CNC info/documents **(1)** • PDM will allow electronic sign off **(1)** • automatic notification for the next stage **(1)** • Data is submitted into PDM for review **(1)** • Allows reduced lead times due to instant data **(1)** • Productivity is improved as changes are tracked **(1)** • Control is instant throughout the process **(1)** • PDM is computerised allowing automatic tracking **(1)** • Stores large amounts of data that is readily accessible **(1)** • Helps to reduce human error which could cause delays **(1)** • Speeds up decision making due to electronic notifications/prompts **(1)** **(4x1)**	**(4)**

6(c) QWC	A response that identifies any eight of the following marking points. There must be both sides of the argument: points for and points against . Max 7 marks if only one side of discussion put forward. **For (max 7)** • Integrated system of CNC machine linked by conveyor/automated guided vehicles/automated storage and retrieval systems **(1)** • Integrated computer system for planning and manufacturing reduces errors **(1)** • Better control over errors **(1)** • Flexibility in structure allows for quick changes in product production **(1)** • Increased productivity due to automation **(1)** • Shorter lead times of products from design to market **(1)** • Lower labour costs due to automation **(1)** • Improved productivity due to removal of human error due to automation **(1)** • Faster/lower costs due to reduction in worker numbers **(1)** • Consistent quality due to automation **(1)** • Lower unit costs due to greater productivity when compared to same number of workers **(1)** • Less wastage **(1)** • Savings when compared to manual production due to little faults/reworking/rejects **(1)** • Better productivity due to automation and control eg 24/7 (manual production workers need breaks) • Reduced human error **(1)** • Integrates with JIT thus reducing storage requirements **(1)** • Machine flexibility **(1)** • Routing flexibility **(1)** • Creates higher skilled technical jobs **(1)** • Flexibility of machines within the cell **(1)** • Production system can respond to market demand **(1)** **Against (max 7)** • Expensive to set up **(1)** • Substantial planning required **(1)** • Complex/sophisticated manufacturing systems required **(1)** • Loss of manual skilled work **(1)** • Needs in-house technical support **(1)** • Set up of FMS may not be justified for simple tasks **(1)** • May have decreased productivity due to set up and machine set up downtime **(1)** • Maintenance 'down time' interrupts production **(1)** • High skilled technical jobs are a cost to the company **(1)** **(8x1)**	**(8)**
	Total for question	**16**

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