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Mark Scheme (Results)

June 2011

GCE Design and Technology:
Product Design (6RM02).

Paper 01: Design and Technology
in Practice (RMT).

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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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that means is clear

  ii) select and use a form and style of writing appropriate to purpose and to comp0lex subject matter

  iii) organise information clearly and coherently, using specialist vocabulary when appropriate

Question Number	Answer	Mark
1(a)	• Aluminium is relatively lightweight **(1)** therefore making the wheelbarrow easier to manoeuvre/use **(1)** • Aluminium is generally weather resistant **(1)** therefore making it better for outdoor use **(1)** • Aluminium does not require a surface finish **(1)** therefore reducing the processes needed (cost implication) **(1)** • Aluminium does not corrode **(1)** which increases the lifespan of the wheelbarrow / therefore making it more cost effective for the user **(1)** • Aluminium is relatively easy to extrude/bend **(1)** due to its ductility/ malleability **(1)** • Aluminium has a good strength **(1)** enabling it to carry heavy loads **(1)** • Aluminium is tough **(1)** enabling it to resist impacts **(1)** • Aluminium is recyclable **(1)** so it can be used again for another product**(1)**	**(6)**
1(b)	• A bush is better under heavy loading **(1)** • The rotation of the wheel is at relatively slow speed **(1)** • Bushes are cheaper than bearings **(1)** • Bushes require less maintenance **(1)**	**(2)**
	Total for question	**(8)**

Question Number	Answer	Mark
2(a)	• Health & Safety notices/signs are placed around the workplace **(1)** therefore users understand/are reminded/are advised of the dangers • Staff are trained/tested in the correct use of tools and equipment **(1)** therefore only safe working practice is used **(1)** • Guards are used on all machines (1) so that hands/fingers etc cannot get caught in moving parts **(1)** • Emergency stop buttons/brakes are used on all machines **(1)** so that they can be stopped quickly in the event of an accident **(1)** • Machine servicing should be kept up to date **(1)** so that the machines are working in an optimum way and therefore safer to use **(1)** • Use /provision of correct personal protective equipment (PPE) is required (1) so that eyes/ears etc are protected **(1)** **Award *a mark for an example of PPE.*** • Working areas designated **(1)** so employees are aware of safe working areas/know how many workers are allowed in the designated areas **(1)** • Machines correctly spaced **(1)** allowing space to manoeuvre safely **(1)** • Keep workshops tidy **(1)** therefore avoiding accidents e.g. cuts/tripping **(1)** • Monitor time spent working (1) to avoid accidents from fatigue **(1)** ***Do NOT award a mark for levels of dust***	**(6)**
2(b)	• The manufacturer has the quality systems in place to ensure repeated quality **(1)** • The product has been tested/approved – independently/appropriately **(1)** • Product is tested at regular intervals **(1)** • Product complies with/meets relevant standards / specifications / requirements **(1)** • You know the product is reliable / good quality / good standard / fit for sale / fit for purpose / safe **(1)** • Customer assurance/confidence/satisfaction **(1)** •	**(4)**
	Total for question	**(10)**

Question Number	Answer	Mark
3(a)	• Set up costs (moulds/tooling etc) is expensive **(1)** therefore it would be necessary to produce the product in volume to cover costs **(1)** • Once the mould has been made the product can be manufactured in a range of colours (1) with very little additional cost/labour costs **(1)** • Clothes pegs are a high volume/demand retail item **(1)** therefore the manufacturers need a high volume production method to keep up with demand **(1)** • The product is a simple/suitable design for mass production **(1)** therefore guarantees repetitive quality/accuracy/can be made very quickly **(1)** • Economies of scale (1)therefore products can be produced more cheaply **(1)** • Pegs are a cheap product **(1)** therefore a large production run is necessary to turn over a reasonable profit **(1)** • Mass production is automated/less labour intensive **(1)** therefore the product is produced more cheaply/saves time and money **(1)**	**(6)**
3(b)	• TQM is how manufacturers implement quality assurance/quality control systems **(1)** • For the continuing development/improvement of the product/process **(1)** • For the complete life cycle of the product **(1)** • Employee involvement/teamwork/work ethos/satisfaction**(1)** • Customer focused involvement/feedback **(1)** • Departments are treated like individual clients which leads to good relationships/good quality products **(1)** • Quality assurance/Quality control test procedures happen at every stage of production **(1)** • ISO 9000 is awarded for companies who demonstrate high standards of consistency/quality which leads to a good reputation/repeat business **(1)** • System to achieve customer satisfaction / confidence by using Quality assurance **(1)** •	**(4)**
	Total for question	**(10)**

Question Number	Answer	Mark
4(a)	• A range of colours are available **(1)** • It takes a range of surface finishes well **(1)** • It is a durable/strong material which is suitable for purpose **(1)** • It has flexibility **(1)** • It can be cleaned easily **(1)** • Resistance to chemicals/liquids/water **(1)** • Good impact resistance **(1)** • Suitable for mass production – injection moulding/rotational moulding **(1) D*o not award a mark for vacuum forming or blow moulding*** • Lightweight **(1)** • Can be recycled when finished with **(1)** • Self finished material **(1)** ***Do NOT award a mark for CHEAP***	**(4)**
4(b)	**Advantages**: • Extremely strong/durable/tough/impact resistant **(1)** • Light weight **(1)** • Good strength to weight ratio **(1)** • Gives good protection for the rider **(1)** • Easily mouldable **(1)** • A uniform strength can be achieved all over the helmet **(1)** • The surface is suitable for the application of various decorative options e.g. decals/paint **(1)** • Has good elastic properties deflecting some of the impact **(1)** • Doesn't degrade e.g. in sunlight/water **(1)** • Aesthetic appeal / range of colours **(1)** **Disadvantages**: • High cost of material /helmet **(1)** • High wastage **(1)** • Time consuming/skilled process to manufacture **(1)** • Relatively high cost of production method **(1)** • Accident/impact means the helmet is no longer serviceable/safe to use **(1)** **Maximum of 5 marks if advantages or disadvantages only are given**	**(6)**
	Total for question	**(10)**

Question Number	Answer	Mark
5(a)(i)	• As the tree grows it produces branches **(1)** • The grain of the branch runs at a different angle to that of the trunk resulting in a knot **(1)**	**(1)**
(a) (ii)	• Knot is harder **(1)** • Difficult to work **(1)** • Causes a weak point in the timber **(1)** • Knots can fall out/leave holes **(1)** • Resin seeps out **(1)** *Do **not*** award a mark for aesthetics	**(3)**
5(b)	• The level of moisture in the wood can be controlled accurately **(1)** resulting in a more reliable/consistent/even moisture content **(1)** • The moisture level can be reduced to a lower/guaranteed level **(1)** which means the timber can be used in drier environments **(1)** • The speed of the drying is much quicker **(1)** meaning capital is tied up for a shorter period/timber gets to the customer more quickly **(1)** • Kiln seasoning is done at a higher temperature **(1)** therefore increasing the effective eradication of infestation in the timber (1) • Kiln seasoning takes up less space **(1)** therefore reducing the need for large premises **(1)** • Kiln seasoning is equally effective all year round/not seasonal **(1)** therefore supplier is consistently able to meet customer demand **(1)**	**(6)**
	Total for question	**(10)**

Question Number	Answer	Mark
6(a)	**The flat-foot follower:** • Has a large bearing surface **(1)** • Is prone to friction/heat **(1)** • Is ideal under heavy load **(1)** • Cannot follow hollow/intricate /sharp contours **(1)** **The knife-edge follower:** • Has a very small bearing surface **(1)** • Provides a very accurate conversion of movement **(1)** • Can be used on hollow /intricate/sharp contours **(1)** • Not good under heavy load **(1)** • Relatively low levels of friction **(1)** **The roller follower:** • Has very low friction **(1)** • Cannot follow intricate/sharp contours **(1)** • Can be used at high speeds **(1)** ***Do NOT award a mark for smooth motion***	**(6)**
6(b)	• The glass is made with sub-microscopic particles of silver-halide **(1)** • The reaction with ultraviolet/sun light/electrical stimuli / heat **(1)** • Causes a chemical change in the glass **(1)**	**(2)**
6(c)	• The running costs are relatively low/cheap **(1)** • Little if any maintenance is required **(1)** • They can be used in remote areas **(1)** • No emissions are given off **(1)** • They don't use finite/man-made resources/is sustainable **(1)** •	**(2)**
	Total for question	**(10)**

Question Number	Answer	Mark
7(a)	• The models can be manipulated/changed/edited quickly **(1)** • The costs involved are relatively low compared to a physical model **(1)** • The models can be distributed electronically e.g. to e-mail/to CNC machine / to RPT machine **(1)** • The models can be stored electronically **(1)** • Virtual testing/simulation is possible **(1)** • They can be used to produce photorealistic/realistic images **(1)** • Relatively quick to produce **(1)** • Viewable from a range of angles/manoeuvrable image **(1)** • Models can be replicated easily/giving multiple options **(1)** ***Do NOT award a mark for more accurate/accuracy***	**(4)**
7(b)	**Advantages:** • Files can be down loaded from a CAD package **(1)** • Items can be produced accurately/precisely **(1)** • Items can be produced quickly • Items can be replicated quickly/the same **(1)** • Curved surfaces can be machined with ease **(1**) • Files can be stored and re-loaded to match user demand **(1)** • Remote manufacturing due to electronic data transfer **(1)** • Reduced amount of waste material **(1)** • An automated production line can be used **(1)** • Automated inspection can be used **(1)** • Less direct contact therefore safer **(1)** • Simulations can be run to check operations **(1)** • They can run 24/continuous production/mass production **(1)** • Several machines can be operated by one operator / lower labour costs **(1)** • Reduced human error **(1)** **Disadvantages:** • The initial set-up costs for the machinery is high **(1)** • Training is required as software gets updated **(1)** • Trained technicians are needed to set up software/hardware **(1)** ***Do NOT award a mark for computer viruses/power failure*** **Maximum of 7 marks if advantages or disadvantages only are given**	**(8)**
	Total for question	**(12)**
	Total for Paper	**70**

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