



**General Certificate of Secondary Education
June 2010**

**Design and Technology
(Resistant Materials Technology)**

45601

Final

Mark Scheme

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1 Any **three** correctly identified requirements.

(a), Possible responses:

(b),

(c)

1. Must be entertaining / interesting
2. Must be soundly constructed
3. Must be made from non toxic materials
4. Must have no small / detachable parts
5. Must be capable of being manufactured in quantity
6. Must be safe to use
7. Must be ergonomically designed
8. Must be eye catching
9. Must be durable

(3 x 1 mark)

Any **three** relevant explanations

Possible responses:

1. This will encourage children to use it
2. It should not fall to pieces
3. Children should not become ill when using it
4. Children like to put things into their mouths and may choke
5. Making things in bulk reduces the unit cost
6. No child should be injured when using the toy
7. It should be easy and comfortable to use
8. Children should be drawn to it
9. The toy should withstand everyday use by children

(3 x 1 mark)

6 marks

2 Mark each idea out of 3 using the following scale:

- | | |
|---|-----------|
| A repeat idea | (0 marks) |
| A simple obvious idea that is lacking in detail | (1 mark) |
| A simple idea displaying some creativity | (2 marks) |
| An idea that displays creativity | (3 marks) |

See Q2 Exemplar answers

(5 x 3 marks)

15 marks

3 An idea may be developed in terms of design features, materials, construction and/or sizes.

Quality of sketching

- Simple line sketch showing limited development (1 mark)
- Quality line sketches or an attempt at 3D sketch showing some development (2 marks)
- Quality 3D rendered sketch showing good development (3 marks)

Quality of notes

- Simple labelling giving limited development detail (1 mark)
- Simple explanations giving some development details (2 marks)
- Several detailed development explanations (3 marks)

Sizes (metric)

- One reference to a realistic dimension (1 mark)
- Two references to realistic dimensions (2 marks)
- Three references to realistic dimensions (3 marks)

9 marks

4 Award **one** mark **each** for a qualified analytical comment.

Possible responses:

The design is environmentally friendly as it is made from a renewable resource.

The design is manoeuvrable because it uses castor wheels.

The design is suitable for outdoor use as it made from Polypropylene which is waterproof.

The design is strong as it is made from tubular steel.

The design is lightweight and easy to move because it is made from aluminium.

Maximum mark

(3 marks)

5 Award **one** mark for **each** correctly identified tool and
(a) **one** mark for **each** correctly identified, specific, process.

(i) **Tool 1** Clamp/Cramp *(1 mark)*

Process look for details of a process that relates **specifically** to using a G Clamp/Cramp.

Possible responses:

- When clamping a piece of wood whilst sawing.
- Applying pressure whilst assembling

(1 mark)

(ii) **Tool 2** Hacksaw (accept junior hacksaw) (1 mark)

Process look for details of a process that relates **specifically** to using a hacksaw.

Possible responses:

- When sawing a piece of metal
- When sawing a piece of plastic

(1 mark)

(iii) **Tool 3** Plane (1 mark)

Process look for details of a process that relates **specifically** to using a plane

Possible responses:

- When smoothing/cleaning a piece of wood
- When shaping a piece of wood

(1 mark)

5 Award **one** mark for **each** correctly identified hazard.

(b) Award **one** mark for **each** relevant precaution.

Possible responses:

Hazard	Precaution
Dust or splinters may fly off the wood	Wear safety goggles /glasses
Someone may distract/knock you	Only one person should be near the machine
Your clothing could get trapped in the disc sander	Ensure that you wear an apron at all times when working in the workshop
Your fingers could come into contact with the sanding wheel	Keep your fingers away from the sanding wheel
Dust could enter your lungs	Wear a dust mask
Dust could enter your lungs	Ensure the extraction equipment is turned on.

(10 x 1 mark)

16 marks

6 Award marks using the following descriptors

Marking out (traditional)

Sufficient detail for most of the design to be marked out by a third party, as a **one off**. Most tools and equipment given (1 - 2 marks)

Sufficient detail for most of the design to be marked out by a third party, **in quantity**, using a **template**. Most tools and equipment given. (3 - 4 marks)

Or

Marking out CAD

Sufficient detail for the design to be drawn by CAD by a third party. Most tools and equipment given.

Look for details relating to:

Computer hardware
Naming software
Net on screen
Use of different coloured lines
Power settings

(1 - 4 marks)

Cutting and shaping (traditional)

Sufficient detail for some of the design to be cut and shaped by a third party as a **one off**. Most tools and equipment given (1 - 2 marks)

Sufficient detail for most of the design to be cut and shaped by a third party, in quantity, using **jigs/templates**. Most tools and equipment given. (3 - 4 marks)

or

Cutting and shaping CAM

Sufficient detail for the design to be manufactured by CAM. Most tools and equipment given.

Look for details relating to:

Transfer of data to CAM
Laser cutter/CNC router
Clamping work piece
Changing tools
Safety

(1 - 4 marks)

Bending / joining

Sufficient detail for some of the design to be bent and joined as **a one off** by a third party. Most tools and equipment given

(1 - 2 marks)

Sufficient detail for most of the design to be bent/joined, **in quantity**, by a third party with use of **jigs/formers**. Most tools and equipment given.

(3 - 4 marks)

Applying the surface finish (traditional)

Sufficient detail for the design to be finished by a third party. Most tools and equipment given.

Look for the following details:

Material preparation

Use of a brush/aerosol/rag

Application of varnish/paint

(1 - 2 marks)

or

Applying the surface finish (CAM)

Reference to the fact that a laser cut stand would not need finishing as the laser produces a good quality finish.

or

Reference to improving the quality of laser cut edges by use of wet and dry paper, 'Brasso' and polishing/buffing

(1 - 2 marks)

Producing the 'kitchen roll' text (traditional)

Sufficient detail for the logo to be applied by a third party, tools and equipment given

Look for the following details:

Use stencil/template

Application of varnish/paint

(1 - 2 marks)

or

Producing the 'kitchen roll' text (CAD/CAM)

Reference to the fact that the logo would be etched in by the laser

Look for the following details:

The logo being produced on a graphics software package (2D design)

The logo being etched by the laser cutter

The logo being produce by the vinyl cutter

(1 – 2 marks)

16 marks

7 Nest of tables

(a)

(i) Award **one** mark for the generic term wood or an incorrect wood

Award **two** marks for:

- Any acceptable light to medium coloured hardwood
- Mahogany
- Teak

(2 marks)

Reasons - Award **one** mark for a suitable correct reason (no single word answers)

Possible responses:

- Attractive grain
- Durable, it will last a long time
- Strength, it will not break
- Environmental friendly material

(1 mark)

Ring

Award **one** mark for the generic term metal or an incorrect metal

7

(a)

(ii) Award **two** marks for gold/brass

(2 marks)

Reasons - Award **one** mark for a suitable correct reason

Possible responses:

- Durable, it will last a long time
- High resistant to corrosion
- Attractive, it is colourful and shiny

(1 mark)

7 Food storage boxes

(a)

(iii) Award **one** mark for the generic term plastic or an incorrect plastic

Award **two** marks for any of the following

- HIPS
- Polypropylene PP
- HDPE
- PVC
- ABS
- PET

(2 marks)

Reasons - Award **one** mark for a suitable correct reason

Possible responses:

- Strong, it will not break
- Tough, it will stand being knocked about
- Durable, it will last a long time
- High resistant to corrosion
- Waterproof, it can be washed
- Hygienic, it will not affect the food
- Capable of being manufactured quickly in large quantities

(1 mark)

7 Tennis racket

(a)

(iv) Award **one** mark for the generic term composite/alloy

Award **two** marks for

- Carbon fibre (Kevlar)
- Aluminium

(2 marks)

Reasons

Award **one** mark for a suitable correct reason

Possible responses:

- Strong, it will withstand hitting tennis balls
- High resistance to impact
- Lightweight, it doesn't take much strength to use it
- Durable, it will last a long time
- High resistant to corrosion
- Capable of being manufactured quickly in large quantities

(1 mark)

Tennis racket handle:

Award 1 mark for rubber

Tennis racket strings:

Allow 2 marks for nylon

- 7 Award **one** mark **each** for the following details or **two** marks
(b) **each** for an expanded detail:

Examples:

- Wood is a sustainable resource as it can be reproduced.
- Wood should only be used from managed forests where trees are replanted once they have been cut down.
- Wooden products are relatively easy to repair.
- Wood is capable of being recycled into chipboard, mdf, card and paper.
- Wooden products can be re used to manufacture other wooden products.
- Wood has the less effect on the environment than many other resistant materials.
- Wood is biodegradable and will return nutrients back into the soil
- Wood should not be burned as it will give off carbon dioxide leading to a reduction in the ozone layer and adding to global warming.
- Wood should not be used from unknown sources as it may have harmed the environment when it was cut down.
- Used wooden products can fuel bio mass power stations

(6 marks)

18 marks

8 Award **one** mark **each** for the following details or **two** marks **each** for an expanded detail:

Look for details relating to:

Market pull relates to the particular needs of society having a direct influence of the development of a product.

Society has an ever increasing demand for greener products and therefore product such as recycling bins, reusable carrier bags, hybrid cars, low energy light bulbs have been developed as a consequence.

Technology push relates to advances in technology having a direct influence on the development of a product.

The developments in electronic engineering have enabled smaller, smarter electronic components to be fitted into everyday products such as the mobile phone, personal hi-fi and cameras.

A fully detailed and comprehensive response that includes details of most of the examples above. The answer is well-structured, with good use of appropriate design & technology terminology and showing a good grasp of grammar, punctuation and spelling.

(7 – 8 marks)

A detailed and comprehensive response that includes some of the examples above. The answer is well-structured, with good use of appropriate design & technology terminology and showing a good grasp of grammar, punctuation and spelling.

(5 – 6 marks)

A fairly detailed response which refers to a few of the examples above. The answer is fairly well structured, with some use of design & technology terminology and with a small number of errors in grammar, punctuation and spelling.

(3 – 4 marks)

A response which contains very limited reference to any of the examples above. The answer is vague or poorly structured, with little use of design & technology terminology and with a considerable number of errors in grammar, punctuation and spelling.

(1 – 2 marks)

A response which is poorly structured with no relevant examples. There is very little or no use of design technology terminology and with many errors in grammar, punctuation and spelling.

(0 marks)

8 marks

9 Award up to **four** marks for details relating to the marking out process:
(a)

Look for the following details:

- Use of a datum line
- Use of a scribe
- Use of a rule
- Use of a try square
- Use of odd leg callipers
- Use of centre line
- Use of a centre punch
- Use of a hammer
- Use of a jig
- Use of a template

(4 x 1 mark)

9 Award **one** mark **each** for details relating to the importance of tolerance when manufacturing components.
(b)

- Very difficult to make a component exactly correct
- Easier to make a component within tolerances
- This is the maximum and minimum sizes a component can be
- Manufacturer knows that if a product is within tolerances then it will work.

(4 x 1 mark)

9 (c) Award **one** mark **each** for the details relating to the importance of quality control to the consumer or **two** marks **each** for an expanded detail:

- Quality control gives the consumer to have a better quality product
- It has undergone numerous checks throughout its manufacture
- Quality control gives the consumer a more reliable product
- There is less chance of a part of the product failing as each component is independently checked.
- Maintenance possible because all components are manufactured to a set tolerance facilitating interchangeability

(4 x 1 mark)

12 marks

10	Award one mark each for four correctly identified ergonomic features:	
(a)		
(i),	Possible suggestions:	
(ii),	A moulded handle	
(iii),	A canopy	
(iv)	Seat belt	
	Hand rail	
	Quick release folding device	
	Wheels	
	Castor front wheel	
	Foot rest	
	Under seat storage	
	Correctly sized for occupant	
	Shape of the seat	<i>(4 x 1 mark)</i>
	Award one mark each for four correct explanation	<i>(4 x 1 mark)</i>
10	Award one mark a correctly identified mechanism	
(b)		
(i)	Possible responses:	
	Wheel	
	Castor	
	Brake lever	
	Disc brake	
	Quick release frame fastener	
	Folding hinges	<i>(1 mark)</i>
10	Award marks for a drawing of the candidates chosen	
(b)	mechanism using the following scale:	
(ii)		
	Diagram:	
	Simple line diagram	<i>(1 mark)</i>
	Detailed diagram	<i>(2 marks)</i>
	Labelling:	
	Simple labelling	<i>(1 mark)</i>
	Labelling using technical vocabulary	<i>(2 marks)</i>
10	Award marks for an explanation of the function of the	
(b)	candidates chosen mechanism using the following scale:	
(iii)		
	Simple explanation of the function of the chosen mechanism	<i>(1 – 2 marks)</i>
	Detailed explanation of the function of the chosen mechanism	<i>(3 - 4 marks)</i>
		17 marks
		TOTAL
		120 marks