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General Certificate of Secondary Education
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Design and Technology: Resistant Materials 45601

(Specification 4560)

Unit 1: Written Paper

Final

Mark Scheme

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1

1 (a) Any **one** correctly identified requirements.
Possible responses:

1. Must be entertaining / interesting to a teenager
2. Must be soundly constructed
3. It should be easy to carry around
4. Must be capable of being manufactured in quantity
5. Must be safe to use
6. Must be ergonomically designed
7. Must be durable
8. Must be stable

Or any other suitable answer

1 mark

Any **one** relevant explanations
Possible responses:

1. This will encourage a teenager to use it
2. It should not break when in use
3. Teenagers will want to take it into different rooms
4. Making things in bulk reduces the unit cost
5. No one should be injured when using the radio
6. It should be easy and comfortable to use
7. It should withstand everyday use by a teenager
8. It should not fall over

Or any other suitable answer

1 mark

1 (b) Any **one** correctly identified requirements.
Possible responses:

1. Must be entertaining / interesting to a teenager
2. Must be soundly constructed
3. It should be easy to carry around
4. Must be capable of being manufactured in quantity
5. Must be safe to use
6. Must be ergonomically designed
7. Must be durable
8. Must be stable

Or any other suitable answer

1 mark

Any **one** relevant explanations
Possible responses:

1. This will encourage a teenager to use it
2. It should not break when in use
3. Teenagers will want to take it into different rooms
4. Making things in bulk reduces the unit cost
5. No one should be injured when using the radio
6. It should be easy and comfortable to use
7. It should withstand everyday use by a teenager
8. It should not fall over

Or any other suitable answer

1 mark

1 (c) Any **one** correctly identified requirements.
Possible responses:

1. Must be entertaining / interesting to a teenager
2. Must be soundly constructed
3. It should be easy to carry around
4. Must be capable of being manufactured in quantity
5. Must be safe to use
6. Must be ergonomically designed
7. Must be durable
8. Must be stable

Or any other suitable answer

1 mark

Any **one** relevant explanations
Possible responses:

1. This will encourage a teenager to use it
2. It should not break when in use
3. Teenagers will want to take it into different rooms
4. Making things in bulk reduces the unit cost
5. No one should be injured when using the radio
6. It should be easy and comfortable to use
7. It should withstand everyday use by a teenager
8. It should not fall over

Or any other suitable answer

1 mark

6 marks

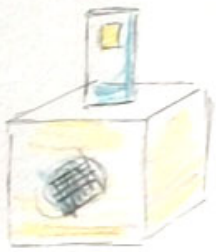
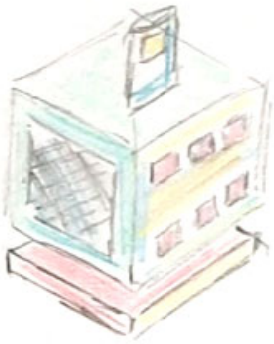
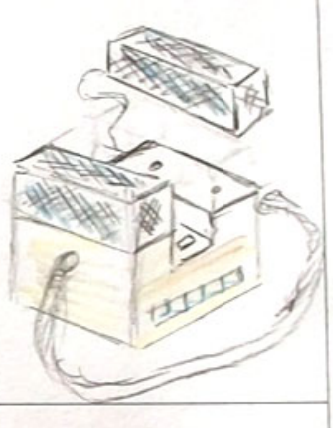
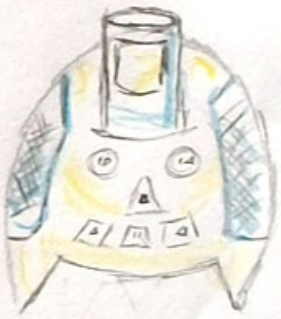
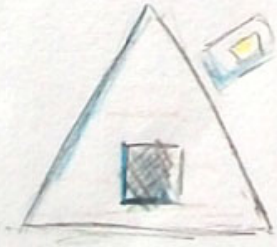
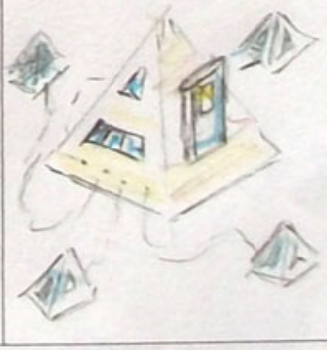
2 Mark each idea out of 3 using the following scale:

- A repeat idea *0 mark*
- A simple / obvious idea lacking in detail *1 mark*
- A simple idea displaying some creativity *2 marks*
- An idea that displays creativity 3 *marks*

(5 x 3 marks)

15 marks

Q2 Exemplar answers

1 mark	2 marks	3 marks
A simple, obvious idea lacking in detail	A simple idea displaying some creativity	An idea that displays creativity
		
		
		

3 Development details could include:

Materials and finishes *3 marks*

There is a maximum of 3 marks for this question. Award up to two marks for materials, award up to two marks for finishes, however, the total may not exceed three marks.

Award marks for details relating to:

- Suitable specific material(s)
- Details of the properties of that material
- A suitable finish
- Details of the properties of that finish

Method of construction *3 marks*

Award marks for details relating to:

- Suitable method(s) of construction
- Details of the method(s) of construction

Design features and sizes *3 marks*

There is a maximum of 3 marks for this question. Award up to two marks for design features, award up to two marks for sizes, however, the total may not exceed three marks.

Award marks for details relating to:

- Explanations of the design features
- Suitable realistic sizes (sizes are expected to be given in mm unless otherwise stated) Realistic imperial measurement are to be awarded 1 mark.

Maximum

9 marks

4 Award **one** mark **each** for a justified evaluative comment.

Justified comments must be relevant to be awarded a mark**.**

3 x 1 mark

3 marks

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

Name: Tenon/Back/Dovetail saw *1 mark*
Process: look for details of a process that relate **specifically** to sawing wood or plastic.

Possible responses:

- When sawing a piece of wood.
- When sawing a piece of plastic

Not when sawing metal

1 mark

Name: File *1 mark*
Process: look for details of a process that relate **specifically** to using a file.

Possible responses:

- When shaping a piece of metal/plastic/wood.
- When smoothing a piece of metal/plastic/wood

1 mark

Name: Tri square. *1 mark*
Process: look for details of a process that relate **specifically** to using a tri square marking

Possible responses:

- When drawing a line at 90^0 to an edge
- When checking a 90^0 corner

Not for simply marking a straight line

1 mark

6 marks

6 (a) Award one mark for each correct response.

- *Apron* to protect your clothes
- *Goggles* to protect your eyes
- *Ear defenders* to protect your hearing
- *Dust mask* to protect your breathing

4 x 1 marks

6 (b) Award one mark each for a correct response:

Ensure that the candidate states a **precaution** and not a general explanation

Sign	Meaning	Precaution
	*This product is flammable.* *(1 mark)*	*Avoid contact with flames* *(1 mark)*
	*This product is toxic.* *(1mark)*	*Do not swallow. Use PPE when using this product.* *(1 mark)*
	*This product can harm the environment* *(1 mark)*	*Don't pour down the sink. Dispose of correctly.* *(1 mark)*

10 marks

7 **Award marks using the following descriptors**

Stage 1: Marking out (traditional)

Candidates may gain marks for giving responses that span both traditional and CAD areas.

Sufficient detail for most of the design to be marked out, as a **one off**. Most tools and equipment given.

1 - 2 marks

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

or

Stage 1: Marking out CAD

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

Look for details relating to:

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

1 - 4 marks

Stage 2: Cutting and shaping (traditional)

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

Sufficient detail for most of the design to be cut and shaped in quantity, using **jigs / templates/systems**. Most tools and equipment given. *3 – 4 marks*

or

Stage 2: 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

Power setting/Speed and feed settings
Changing tools/tool selection
Safety *1 – 4 marks*

Stage 3: Bending / joining (traditional)

Sufficient detail for some of the design to be bent and joined as **a one off**. Most tools and equipment given. *1 - 2 marks*

Sufficient detail for most of the design to be bent/joined, **in quantity** with use of **jigs/formers.** Most tools and equipment given. *3 – 4 marks*

or

Stage 3: Joining CAM

Laser cutter/CNC router *1 mark*
Transfer of data to CAM *1 mark*
Description of how to cut the joints *1 – 2 marks*

or

Pewter casting

Sufficient detail for some of the design to cast. Most tools and equipment given *1 – 2 marks*

Sufficient detail for most of the design to cast**.** Most tools and equipment given. *3 – 4 marks*

Stage 4: Applying the surface finish (traditional)

Sufficient detail for the design to be finished. 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

Stage 4: 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

Stage 5: Producing the text that says '1st' (traditional)

Sufficient detail for the logo to be applied, tools and equipment given

Look for the following details:

Use stencil/template
Application of varnish/paint

1 - 2 marks

or

Stage 5: Producing the text that says '1st' **(CAD/CAM)**

Reference to the fact that the logo would be etched in by the laser. The candidate may simply reference back to Stages 1 and 2.

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

8 (a) **Kitchen stool**
Material: Award **one** mark for the generic term wood.

Award **two** marks for suitable light/medium coloured wood:

Possible responses:

- Pine
- Beech
- Oak
- Ash

Or similar

2 marks

Reason: Award **one** mark for a suitable correct reason
Possible responses:

- It has an attractive grain
- It looks good
- It is durable
- It will last a long time
- It is strong
- It is renewable
- It is environmentally friendly

Not cheap unless qualified
Not light unless qualified
Not easy to work unless qualified

1 mark

Source of material: Award one mark for a suitable correct response.

- Trees *1 mark*

Toy train
Material: Award **one** mark for the generic term plastic or an incorrect plastic

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

- ABS
- Polypropylene PP
- PVC
- HIPS
- Polythene (HDPE)

Not Acrylic

2 marks

Reason: Award **one** mark for a suitable correct reason
Possible responses:

- It is tough
- It is durable/last along time/strong
- It is waterproof
- Doesn't corrode(rust)
- It is hygienic
- It can be moulded
- It is lightweight
- Self finished

1 mark

Source of material: Award one mark for a suitable correct response.

- Oil (Crude)/Coal/Corn starch *1 mark*

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

Candidates may choose to answer this question from the positive/negative or a mixture of view points.

Possible responses:

- Metal is a non renewable resource.
- The extraction of metal ore from the earth creates scars in the landscape.
- The production of metal from ore uses vast quantities of energy.
- The production of metal from ore pollutes the atmosphere
- The manufacture of metal products uses vast quantities of energy
- The manufacture of metal products pollutes the atmosphere
- Pollution of the atmosphere leads to global warming
- Metal products are can be repaired.
- Metal is capable of being recycled.
- Some metals are biodegradable.

7 marks

15 marks

9 (a) Award **one** mark **each** for **three** correctly identified components.

Award up to **two** marks **each**, for a detailed description of the maintenance operation.

Candidates may give maintenance operations within the component cell.

Component	Maintenance operation
Chain/ sprocket/ pedal *(1 mark)*	*Clean, oil.* *(2 marks)*
Tyres *(1 mark)*	*Check level/depth of tread and inflate to correct pressure* *(2 marks)*
Brakes *(1 mark)*	*Check pad/block wear and replace as necessary* *(2 marks)*
Brake/gear cables/levers *(1 mark)*	*Oil and adjust, replace if required* *(2 marks)*
Saddle *(1 mark)*	Adjust height, check security *(2 marks)*
Steering/ spokes *(1 mark)*	*Check for play. Adjust or replace if necessary.* *(2 marks)*
Suspension *(1 mark)*	*Clean, oil and check pressure* *(2 marks)*

9 x 1 mark

9 (b) Award up to **two** marks **each** for details relating to why a designer should consider the importance of maintenance when designing products.

Look for details relating to:

- Safety; components are less likely to fail if they are well maintained and therefore the will be safer.
- Reliability; the product is less likely to break down if maintained. Worn components are replaced
- Sustainability; the life of the product will be extended if components that wear out can easily be replaced and therefore there will be less impact on the natural resources.
- Efficiency; a product will run with greater efficiency if worn out components can be replaced and therefore there will be less pollution of the environment.
- Cost; It is cost effective to replace worn out components than replacing the complete product.

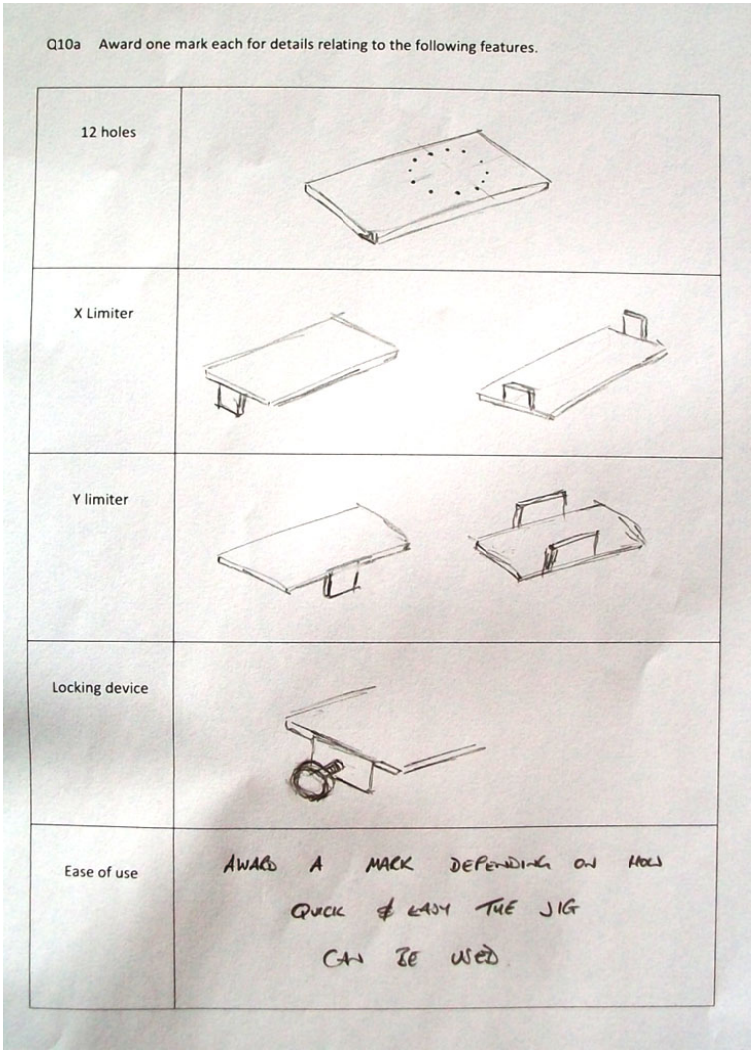
8 x 1 mark

17 marks

10 (a) Award **one** mark for **each** of the following features:

- 12 guide holes
- X direction limiter
- Y direction limiter
- Locking device
- Ease of use

5 x 1 marks



10 (b) Award marks for details relating to how the use of jigs, moulds and templates affect the manufacture of products.

Look for details relating to:

Accuracy: The level of accuracy is improved as human error is limited.

Consistency: The level of consistency is improved as all the products will be identical.

Speed: The time taken to produce a product is reduced as there is no requirement for marking out.

Cost: The cost of producing products is reduced as the use of jigs, moulds and templates means less labour is required. Initial set up cost is high.

8 x 1 marks

13 marks

11 **Initially, mark the answer based on the technical content.**

Look for details relating to:

Sustainability is the ability of a product to be used indefinitely with limited impact on the environment.

A product manufactured from wood is considered to be very sustainable as it is renewable, can be recycled, reused and has limited effect on the environment when being processed.

A product manufactured from metal can be sustainable if it is recycled and/or reused at the end of its life. However, metal is a non renewable resource and harms he environment when it is being processed.

A product manufactured from plastic can be sustainable if it is recycled and/or reused at the end of its life. However, plastic is a non renewable resource and harms he environment when it is being processed.

Now refine your mark depending on the QWC. A technically correct response that displays poor QWC may lose 1 or 2 marks. A technically incorrect response that displays good QWC may gain 1 or 2 marks.

A fully detailed and comprehensive response. The answer is well-structured, with good use of appropriate design & technology terminology and showing a good grasp of grammar, punctuation and spelling. *9 - 10 marks*

A detailed and comprehensive response. 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 response. 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. 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 limited response . 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*

10 marks

Total 120 marks