



**General Certificate of Secondary
Education**

*Design and Technology:
Resistant Materials*

Specimen Mark Scheme

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Q1

- Candidate provides a full and detailed consideration of some of the more important issues and provides a clear evaluation of each of these, e.g. Must provide the correct level of illumination - too much or too little light can harm your eyesight; Must be capable of being manufactured in quantity. This will ensure that the price is kept low; Must be safe to use - no one should injure themselves when using the light; Must be ergonomically designed - the user should find it comfortable and easy to use, etc.

(5-6 marks)

- Candidate provides a reasonable consideration of some appropriate issues and provides a fair evaluation of these, e.g. Must be ergonomically designed - the user should find it comfortable and easy to use; Must be durable - the customer will want the product to last for a few years etc.

(3-4 marks)

- Candidate provides a limited consideration of less significant issues with little or no evaluation of these, e.g. Must be eye catching - people will buy an interesting/novel/stylish design; Must be well made - the customer will look for quality of manufacture, etc.

(1-2 marks)

- No real consideration or evaluation of appropriate issues.

(0 mark)

6 marks

Q2 Mark each idea out of 2 using the following scale:

- An idea that is similar in principle to the other ideas *0 marks*
- A simple obvious idea *1 mark*
- An original idea displaying creative design thinking *2 marks*

Maximum mark **10 marks**

Q3 Award **one** mark **each** for an analytical comment made against the candidates' original specification.

Maximum mark **3 marks**

Q4 Quality of sketching

- Simple line sketching *1 mark*
- Quality line sketches or an attempt at 3D sketches *2 marks*
- Quality 3D sketches *3marks*
- Quality 3D rendered sketches *4marks*

Quality of notes

- Labelling *1 mark*
- Explanation *2 marks*

Materials

- Generic materials mentioned *1 mark*
- Some appropriate specific materials given *2 marks*
- All appropriate specific materials given *3marks*

Sizes

- One realistic dimension given *1 mark*
- Two or more realistic dimensions given *2 marks*

Constructional details

- Limited construction detail given *1 mark*
- Some constructional detail given *2 marks*
- Most constructional detail given *3 marks*
- Sufficient detail for the design to be manufactured by a third party *4 marks*

15 marks

Q5b Award **one** mark for **each** correctly identified hazard.
Award **one** mark for **each** relevant precaution.

Possible responses:

Hazard	Precaution
Cuttings/swarf may fly off the drill	Wear safety goggles /glasses
Your hair could get trapped	Ensure that long hair is tied back
Someone may distract/knock you	Only one person should be near the machine
Your clothing could get trapped in the drill	Ensure that you wear an apron at all times when working in the workshop
The drill may be turned on when you are changing the drill bit	Isolate the machine before changing the drill bit
Your clothing may get caught in the rotating chuck	The guard must be down when using the drill
Your hair could get trapped in the rotating belts	Belt guard should be closed
The chuck key may be fly out of the chuck in the chuck	Always remove the chuck key

10 x 1 mark

16 marks

Q6a Either design could be made from wood, metal or plastic.

Award **one** mark for the generic term plastic

Award **two** marks for any suitable specific plastic.

Possible responses:

- ABS
- GRP
- HIPS
- Polycarbonate
- Polypropylene
- HDPE
- PVC
- Acrylic

2 x 1 mark

Reasons:

Possible responses:

- Immaculate surface finish
- Self coloured
- Ideal for quantity production
- Durable
- Weatherproof

1 x 1 mark

or

Award **one** mark for the generic term metal

Award **two** marks for any suitable specific metal

Possible responses:

- Steel
- Aluminium
- Brass

2 x 1 mark

Reasons

Possible responses:

- Good strength to weight ratio
- Durable
- Cost (inexpensive)
- Suitable for quantity production

or

Award **one** mark for the generic term wood

Award **two** marks for any suitable hardwood / softwood / manufactured board.

Possible responses:

- Beech
- Ash
- Oak
- Teak
- Mahogany
- Pine
- Plywood
- mdf

2 x 1 mark

Reasons

Possible responses:

- Attractive
- Strong
- Durable

1 x 1 mark

6b) Award marks using the following descriptors

Marking out (traditional)

Sufficient detail for most of the design to be marked out by a third party, most tools and equipment given. *3 - 4 marks*
Sufficient detail for some of the design to be marked out by a third party, some tools and equipment given. *1 - 2 marks*

or

Marking out CAD

Monitor/mouse/keyboard *1 mark*
Graphics package e.g. Techsoft 2D Designer
 Pro desktop
 Corel draw *1 mark*
Description of how to produce the image *1 - 2 marks*

Cutting and shaping (traditional)

Sufficient detail for most of the design to be cut and shaped by a third party, most tools and equipment given. *3 - 4 marks*
Sufficient detail for some of the design to be cut and shaped by a third party, some tools and equipment given. *1 - 2 marks*

or

Cutting and shaping CAM

Transfer of data to CAM *1 mark*
Laser cutter/CNC router *1 mark*
Description of how the cut and shape the cup holder *1 - 2 marks*

Bending / joining (traditional)

Sufficient detail for most of the design to be bent and joined by a third party, most tools and equipment given. *3 - 4 marks*
Sufficient detail for some of the design to be bent and joined by a third party, some tools and equipment given. *1 - 2 marks*

or

Joining CAM

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

Finishing and application of logo(traditional)

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

1 - 2 marks

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

1 - 2 marks

or

Applying the surface finish

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

or

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

1 - 2 marks

Producing the ‘recycled paper’ text (Laser cut)(vinyl cutter)

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

or

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

1 - 2 marks

19 marks

Q7a Product A - Award **one** mark for the generic term wood or an incorrect wood

- Award **two** marks for any suitable light coloured wood
2 x 1 mark

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

Possible responses:

- Attractive grain
- Durable
- Cost effective
- Environmentally friendly material

1 x 1 mark

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

- Award **two** marks for stainless steel

2 x 1 mark

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

Possible responses:

- Strong
- Durable
- High resistant to corrosion
- Hygienic
- Capable of being manufactured quickly in large quantities

1 x 1 mark

Product C - Award **one** mark for the generic term plastic or an incorrect plastic

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

- ABS
- HIPS
- Polycarbonate PC
- Polypropylene PP
- HDPE
- PVC

2 x 1 mark

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

Possible responses:

- Strong
- Tough
- Durable
- High resistant to corrosion
- Waterproof
- Hygienic
- Capable of being manufactured quickly in large quantities

1 x 1 mark

Product D - Award **one** mark for the generic term plastic or an incorrect plastic

- Award **two** marks for

- GRP
- Carbon fibre
- Polycarbonate

2 x 1 mark

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

Possible responses:

- Strong
- High resistance to impact
- Lightweight
- Durable
- High resistant to corrosion
- Capable of being manufactured quickly in large quantities

1 x 1 mark

Q 7b Award **one** mark **each** for the following details (maximum 2 marks):

- *Crude oil is found underground*
- *The oil has to be refined*
- *The process happens at a chemical plant*

2 x 1 marks

Q7c Award **one** mark **each** for the following details (maximum 3 marks):

- Oil is a finite resource
- Oil takes millions of years to form
- Oil consumption is high
- There is an increasing demand for oil
- Other materials will need to be found
- 6 R's: repair, reduce, recycle, reuse, rethink, refuse

17 marks

Q8a

Good evaluation of the effectiveness of both the palm sander and the cork block with reference to more relevant appropriate examples, e.g .Palm sander – requires less effort to use, gives a better quality finish, is quicker to use. Cork block- does not require electricity, comes from a renewable source, it has undergone fewer processes during its manufacture, etc.

(3 - 4 marks)

Fair evaluation of the effectiveness of both the palm sander and the cork block with reference to at least one appropriate example, e.g .Palm sander – is quicker to use. Cork block- it has less parts, etc.

(1 – 2 marks)

A very poorly structured evaluation with no relevant examples.

(0 marks)

Q8b Award **one** mark for **each** correctly identified environmental advantage.
Award **one** mark for **each** relevant explanation.

Possible responses:

- It does not use electricity
- It comes from a renewable resource
- It has less parts
- It has undergone fewer processes during its manufacture

2 x 2 marks

Q8c Award **one** mark for **each** correctly identified ergonomic feature.
Award **one** mark for **each** relevant explanation

Look for details relating to:

- It is shaped to fit the palm of your hand
- The switch can be easily accessed by your finger
- It has a dust collector
- It has a high friction surface on the handle

Maximum mark

6 marks

14 marks

Q9a Award **one mark each** for **two** correctly identified reasons.

Possible response:

- Any reference to testing the product
- Any reference to finding faults in the product
- Any reference to saving cost in the event of problems being identified
- Any reference to being able to seek consumer opinion
- Any reference to being able to modify the product
- Any reference to producing an improved product
- Being able to see the idea in 3D

2 x 1 mark

Q9b Award **one mark each** for a correctly identified modelling material, their advantages and their disadvantages.

Materials

Card
Foam board
Wire
Poly morph
Plasticine
Mod roc
Balsa
Construction kits

Advantages

- Inexpensive
- Easy to work
- Quick to produce
-

1 x 1 mark

Disadvantages

- Weak
- Non durable
- Does not function

1 x 1 mark

Rapid prototyping (a process which may use different materials, for example, cellulose powder plus glue and epoxy resin)

Advantages

- Very accurate result
- Stronger than card, balsa or a construction kit
- Relatively quick to manufacture *1 x 1 mark*

Disadvantages

- Very expensive set up cost
- Very expensive unit cost *1 x 1 mark*

8 marks

Q10a

Fully detailed and comprehensive response which includes details of several of the examples below and that 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 some of the examples below and that 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 below, that 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, with very little or no use of design technology terminology and with many errors in grammar, punctuation and spelling. (0 marks)

Possible examples:

- Product lifecycle is the life expectancy of a product

A plastic fork

- Has a 'one use' life span
- Has been made using inexpensive, poor quality materials
- It can even fail during use
- Has been manufactured by a injection moulding
- This is a quick, relatively inexpensive method of manufacture for high volume production
- At the end of its life it will then be thrown away/recycled

A biro

- Has a short life span
- Has been made using inexpensive materials
- It has relatively few components
- It will be thrown away/recycled after it is empty

A car

- Has a relatively long life span of 10 or more years
- Has been made using quality materials
- Has a large number of components
- Components are designed to be replaced when worn out
- It must be recycled after use

(6 marks)

Q10b

Fully detailed and comprehensive response which includes details of several of the examples below and that 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 some of the examples below and that 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 below, that 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, with very little or no use of design technology terminology and with many errors in grammar, punctuation and spelling.
(0 marks)

Possible details.

- *To extend the working life of the product*
- *Thus reducing the need to manufacture more products*
- *Thus reducing the consumption of raw materials*
- *Thus reducing pollution created during manufacture*
- *To ensure the efficient operation of the product*
- *Thus reducing the power it consumes*
- *To ensure the safe operation of the product*

6 marks

12 marks

ADDITIONAL SAMPLE QUESTIONS

1. Product - Award **one** mark for the generic term 'plastic' or an incorrect plastic

- Award **two** marks for one of the following:

- GRP
- Carbon fibre
- Polycarbonate

2 marks

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

Possible responses:

- Strong
- High resistance to impact
- Lightweight
- Durable
- High resistance to corrosion
- Capable of being manufactured quickly in large quantities

1 x 1 mark

3 marks

2 (a) Award **one** mark for a suitable smart material

Possible response:

- polymorph

1 mark

(b) Award up to **four** marks for details relating to the advantages of using polymorph.

Look for details relating to:

- Quick to produce
- Can be remoulded
- Can be easily moulded into shape
- Gives an accurate shape
- Has a high quality finish

4 x 1 mark

5 marks