



## General Certificate of Secondary Education

# Design and Technology: Resistant Materials Higher Tier *Specification 3545*

## Mark Scheme

### *2005 examination – June series*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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.

## Higher 3545

### Question 1

Any **four** correctly identified requirements.

Possible responses:

Must securely hold the stationery/mobile phone equipment.

Must be soundly constructed.

Must be capable of being manufactured in quantity.

Must be safe to use.

Must fit into the office environment.

Must allow easy access to stationery/mobile phone equipment.

Must be cost effective.

Must be durable.

Must be aesthetically pleasing/stylish.

Must be compact.

Must have a non-marking base.

Must be stable.

(4 x 1 mark)

**Four** correct explanations.

(4 x 1 mark)

**Total 8 marks**

### Question 2

Quality of sketches:

Quality 3D sketches with colour

4-5 marks

Quality line sketches or an attempt at 3D sketches

2-3 marks

Simple line sketching

1 mark

(5 marks)

Quality of notes:

Detailed explanation describing and qualifying several features

3 marks

Simple notes describing the features

2 marks

Labelling

1 mark

(3 marks)

Variety of ideas:

Mark **each** idea separately against the following scheme

An excellent idea which differs in approach or principle, fulfils the design brief and the specification.

6 marks

A very good idea which differs in approach or principle, fulfils the design brief and the specification.

5 marks

A good idea which differs in approach or principle, fulfils most of the design brief and specification.

4 marks

An idea which differs in approach or principle, fulfils most of the design brief and the specification.

3 marks

An idea which fulfils the design brief and specification but is similar to the other ideas.

2 marks

A simple idea.

1 mark

(3 x 6 marks)

Quality of evaluation:

Award up to **three** marks for **each** evaluation using the following scale:

|                                 |         |                       |
|---------------------------------|---------|-----------------------|
| Evidence of analytical thinking |         |                       |
| 3 or more points considered     | 3 marks |                       |
| 2 points considered             | 2 marks |                       |
| 1 point considered              | 1 mark  | (3 x 3 marks)         |
|                                 |         | <b>Total 35 marks</b> |

*Question 3*

(a) Award up to **two** marks for a detailed explanation.

Possible response:

A full sized working model of a product which is made prior to the product going into full-scale production. (2 marks)

(b) Award **one** mark (up to a maximum of 4) for **each** of the following details:

Possible responses:

- 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 an improved product
- (4 marks)

**Total 6 marks**

*Question 4*

Quality of sketches:

|                           |         |           |
|---------------------------|---------|-----------|
| Quality 2D or 3D sketches | 2 marks |           |
| Simple 2D sketches        | 1 mark  | (2 marks) |

Quality of notes:

|                |         |           |
|----------------|---------|-----------|
| Detailed notes | 2 marks |           |
| Labelling      | 1 mark  | (2 marks) |

Method of manufacture:

**Batch production**

- |                               |                     |
|-------------------------------|---------------------|
| Look for details relating to: | Injection moulding  |
|                               | Vacuum forming      |
|                               | Blow moulding       |
|                               | Jigs/Formers/Moulds |
|                               | CAM/CNC/CIM         |
|                               | Laser               |
|                               | Aluminium casting   |
|                               | Extrusion           |

|   |            |            |
|---|------------|------------|
| A suitable and very detailed method of manufacture  | 9-10 marks |            |
| A suitable and detailed method of manufacture       | 7-8 marks  |            |
| A suitable method of manufacture, some detail given | 5-6 marks  |            |
| A suitable method of manufacture, limited detail    | 3-4 marks  |            |
| A suitable method identified                        | 1-2 marks  | (10 marks) |

**One off production**

|  |         |
|--|---------|
| A suitable and detailed method of construction             | 4 marks |
| A suitable method of construction, with some inaccuracies  | 3 marks |
| Incorrect method of construction, but would function       | 2 marks |
| Incorrect method of construction, little chance of success | 1 mark  |

**Total 14 marks**

*Question 5*

Award **one** mark each for a correct response

Possible responses:

- Check that the drill guard is working.
- Check that the emergency stop button is working.
- Check that the wiring is in good order.
- Check that the drill bits are sharp.
- Check that the isolator switch is working.
- Check the chuck key has been removed.
- Check the work piece is securely held.
- Check it has been professionally tested.
- Check the machine is well lubricated.
- Check the machine has been cleaned.

(no marks for referring to personal protection) (2 x 1 mark)

Award **one** mark for a suitable explanation (2 x 1 mark)

**Total 4 marks**

*Question 6*

(a) Award **one** mark for **each** correctly entered cell.

|                             | <b>Input</b>                      | <b>Process</b>  | <b>Output</b>                                   |
|-----------------------------|-----------------------------------|---|---|
| <b>the paper punch</b>      | <i>The handle is pushed down</i>  | <i>The mechanism pushes the cutters/ punches down</i> | <i>The paper is punched/ the holes are made</i> |
| <b>the pencil sharpener</b> | <i>The handle is turned round</i> | <i>The cutters shave the pencil</i>                   | <i>The pencil is sharpened</i>                  |

(6 marks)

(b) Award **one** mark **each** for a correctly identified solution and up to two marks for the explanation.

**Stability**

The use of five wide feet/legs 1 mark (1 mark)

Explanation – look for details relating to:

Extends the base further out than the perimeter of the seat. 1 mark  
Prevents the chair from toppling over. 1 mark (2 marks)

**Mobility**

The use of castors/wheels 1 mark (1 mark)

Explanation – look for details relating to:

Allows the chair to move 1 mark  
Castors are self aligning, allowing ease of movement in any direction. 1 mark (2 marks)

**Height adjustment**

The use of a gas/spring/screwthread/hydraulic mechanism (no marks for lever). 1 mark (1 mark)

Explanation – look for details relating to:

When the lever is pressed it allows the seat to raise, body weight to lower the seat and gas to damp the process. 1 mark (2 marks)

**Back rest adjustment**

The use of a pivot or sliding mechanism 1 mark (1 mark)

Explanation – look for details relating to:

The pivot allows the back rest to tilt and align itself with the persons back. 1 mark  
The sliding mechanism allows for the depth of a person. 1 mark (2 marks)

**Total 18 marks**

*Question 7***(a) Magazine file A**Material:

Award **one** mark for a suitable material

Possible responses:

Plywood

Veneered MDF

(1 mark)

Reasons:

Award **one** mark **each** for **two** suitable reasons

Possible responses:

Attractive

Strong

Durable

Available in large sheets

Smooth surface

Recyclable

Cost (must be justified)

Easy to make (must be justified)

Easy to finish (must be justified)

Lightweight

Suitable for quantity production

(2 marks)

**Magazine file B**

Material:

Award **one** mark for a suitable material.

Possible responses:

Steel

Aluminium

(1 mark)

Reasons:

Award **one** mark **each** for **two** suitable reasons

Possible responses:

Good strength to weight ratio

Durable

Cost (must be justified)

Suitable for quantity production

Recyclable

Attractive

Strong

Durable

(2 marks)

**Magazine file C**

Material:

Award **one** mark for a suitable material.

Possible responses:

ABS

HIPS

Polycarbonate PC

Polypropylene PP

HDPE

PVC

Acrylic

(1 mark)

Reasons:Award **one** mark **each** for **two** suitable reasons

Possible responses:

Immaculate surface finish

Self coloured

Ideal for quantity production

Durable

Recyclable

Cost (must be justified)

Lightweight

(2 marks)

(b) (i) **Magazine file A**Award **one** mark for suitable correct finish:

Possible responses:

Wax

Polyurethane Varnish

Stain

Acrylic varnish

(1 mark)

(ii) **Magazine file B**Award **one** mark for suitable correct finish:

Possible responses:

Gloss paint

'Hammerite'

'Smoothrite'

Powder/plastic coating

Anodised (aluminium only)

Cellulose spray

Aluminium/stainless steel (no finish required/polish/buff)

Lacquer

(1 mark)

**Total 11 marks***Question 8*(a) Award **one** mark for **each** correctly entered cell.

| <b>Scale of Production</b>   | <b>Description</b>   | <b>Product</b>          |
|------------------------------|--|-------------------------|
| <b>One-off production</b>    | <i>A single product is made</i>                                    | <i>The Eiffel Tower</i> |
| <b>Batch Production</b>      | <i>Machinery can be used to make batches of different products</i> | <i>e.g. CD racks</i>    |
| <b>Mass Production</b>       | <i>Many identical products can be made</i>                         | <i>e.g. Cars</i>        |
| <b>Continuous Production</b> | <i>Non stop production 24/7</i>                                    | <i>e.g. Oil</i>         |

Quantity answers acceptable

(6 marks)

- (b) Award **one** mark (up to a maximum of 6) for **each** for correct response.

Look for details relating to:

**One off Production**

High unit cost due to:

Labour costs being high

Only small numbers can be made

Skilled workforce required

High cost of raw materials

**Batch Production/Mass Production**

Medium unit cost due to:

Use of CAM

Subcontracting

Semi skilled workforce required

**Continuous Production**

Low unit cost due to:

Extensive use of CAM

Intensive use of machinery 24/7

Intensive use of resources (buildings, heating and lighting)

Unskilled workforce

(6 marks)

**Total 12 marks**

*Question 9*

- (a) 9.8 (1 mark)

- (b) 10.2 (1 mark)

- (c) Award **one** mark for a correct tool.

Possible responses:

Micrometer

Vernier calliper

(1 mark)

- (d) Award up to **two** marks for a suitably explained advantage.

Possible responses:

Less skill required by the user – therefore semi skilled/ unskilled labour can be used.

Reduced chance of a mistake – therefore there will be less wastage.

Quicker than reading a micrometer – therefore the time taken to make the product will be reduced.

(2 marks)



- 
- (e) Award **one** mark **each** for correct responses.

Look for details relating to:

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 marks)

**Total 9 marks**

*Question 10*

- (a) Award **one** mark for **each** correctly identified product.

BEAB Any electrical product (1 mark)

BTMA Any toy (1 mark)

- (b) Award **one** mark **each** for correct responses.

Looking for details relating to

**BSI**

Sets standards for safety, quality and design

Tests products

Awards safety label

Kite mark

**Consumer**

Reassurance that they are buying a safe, quality product. (6 marks)

**Total 8 marks**

**TOTAL MARKS ON PAPER 125**