

# GCSE 2004

## *June Series*



## Mark Scheme

### Design and Technology: Product Design (3544 - Higher)

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**ASSESSMENT and QUALIFICATIONS ALLIANCE**  
**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

June Examination 2004

**Design and Technology: Product Design**

Higher Tier

**Question 1**

- (a) There are two sets of marks for this question, one for quality of drawing and one for labelling.

**Quality of drawing**

- |  |     |
|--|-----|
| Some attempt at representation of a product. | (1) |
| Recognisable drawing of a product.           | (2) |
| Quality drawing of a product.                | (3) |

**Quality of labelling**

- |                            |     |           |
|----------------------------|-----|-----------|
| Minimal labelling          | (1) |           |
| Some appropriate labelling | (2) |           |
| Comprehensive labelling    | (3) | (6 marks) |

- (b) (i) One mark each for naming a suitable material, component or ingredient.  
 No marks for generic groups. Candidates must name specific materials etc. (2 marks)

For example:

a *steady hand game* will include components such as, a resistor, LED, battery, switch and be made from a plastic such as HDPE.

a *metal picture frame* could be made from pewter or aluminium, with glass or plastic insert and card backing.

a *chocolate roll* will contain flour, baking powder, salt, cocoa powder, sugar, egg, milk, margarine or butter and covered in chocolate.

a *soft toy* made from new materials such as polyester, washable filling, eyes.

a *bone china plate* includes ground down bone, clay constituents, transfer decoration with heavy layer of clear glaze.

a *wooden toy* made from hardwoods such as beech, or softwoods like pine which may also be painted.

a *plastic toy* made from thermoplastics such as polyethylene are used for injection moulding and blow moulding.

*packaging* may include layered card, sheet formed plastic (PVC) cover etc.

- (ii) One mark each for a correct property or nutritional group for materials, components or ingredients named above.

No marks for an unrelated property or nutritional group.

(3 marks)

Using the above examples, the properties or nutritional values might be:

*a steady hand game*: thermoplastics can be used clear or coloured, easily cleaned and are non-toxic, suitable for children's toys; copper wire is conductive and ductile/flexible.

*a metal picture frame*: pewter has a low melting point, but good finish; aluminium is light in weight and easily manufactured, will not rust and can be polished to give a shining appearance.

*a chocolate roll*: carbohydrate loaded with sugar and flour base, very little nutritional value.

*a soft toy*: polyester is a hard-wearing material that dries easily when washed, is light and can be machine-washed.

*a bone china plate*: bone china is robust, relatively stable and strong and expensive, decoration with transfers applied under a heavy layer of clear glaze to enable it to be cleaned easily.

*a wooden toy*: real woods when well finished are warm and smooth to touch and look expensive; wood used for carving needs to be dense with no visible grain; a painted finish must use a lead free paint to make it child safe.

*a plastic toy*: thermoplastics can be used clear or coloured to give a modern appearance; they can scratch or discolour to look cheap, but are cleaned easily and are non-toxic making them suitable for children's toys.

*packaging*: using card enables colour printing of information to attract the buyer's attention, layered card and plastic protects and holds the item/contents for transport; a PVC cover is transparent allowing item/contents to be seen clearly.

- (iii) One mark for a correctly identified environmental or health issue. (2 marks)

For example:

*a steady hand game*: Environmental implications of small electrical components that are not recycled, batteries often end up in landfills causing pollution; plastic not often recycled because of the energy used.

*a metal picture frame*: Glass breaks and can cause injury. Aluminium of the frame can be recycled. The card often wears and has to be replaced.

*a chocolate roll*: Empty calories with little nutritional value.

*a soft toy*: New fabrics are being developed continuously. Most are made from the by-products of the refining of oil.

*a bone china plate*: It is fired at a high temperature and is less likely to fail during firing, because of its strength. Obvious problems with bone content and vegetarians.

*a wooden toy*: Forests are being destroyed at an alarming rate; this will lead to environmental problems if new trees are not planted to replace those used. Carving provides employment for many people.

*a plastic toy*: Plastic does not degrade when thrown away so causes problems as rubbish in landfills. Harmful fumes may be produced during manufacture and incineration. Polythene is a thermoplastic so can be recycled.

*packaging*: Card is printed and sealed so will not be recycled and ends up in landfills. A PVC cover could be recycled but energy costs to recycle make this unlikely at present.

- (iv) One mark for a correctly named aesthetic feature or functional quality (1 mark)

For example:

*a steady hand game*: brightly coloured to attract attention.

*a metal picture frame*: shiny silver colour gives solid, heavy appearance.

*a chocolate roll*: luxurious dark chocolate colour.

*a soft toy*: soft, textured fur, attractive colour.

*a bone china plate*: transfer decoration.

*a wooden toy*: strong primary colour to attract children's attention.

*a plastic toy*: easily made in bright colours to attract children's attention.

*packaging*: good use of colour, decoration, attractive lettering, design.

**Total 14 marks**

**Question 2**

- (a) Materials correctly prepared. No marks for generalised materials e.g. metal, plastic, wood, clay. Reward wherever a correct answer appears.  
*Award 1 mark for each stage of preparation.* (4 marks)

	<b>Plate</b>	<b>Packaging</b>	<b>Steady hand game</b>
(i) Preparation of materials, components or ingredients  (4)	Wedge clay. Place on centre of wheel Line up jig and dolly. Accept slip casting.	Check card and ink levels in printer.	Collect components, mould and plastic to vacuum form/ injection mould.

- Clear understanding of manufacturing processes and sequence correct.  
*1 mark for each stage, more complex explanations gain more marks.* (6 marks)

(ii) How the product is made  (6)	Wheel turns, clay into dolly, jig is lowered onto clay to form plate. Plate removed from wheel. If slip cast, slip is poured into mould. After 15 mins excess slip is poured away. Clay allowed to harden before mould removed.	Design printed onto card. Card cut and folded. May use die cutter, press knives.	Wire formed into required shape using a jig. Plastic vacuum formed or injection moulded for handle and base. Circuit soldered together with LEDs placed in drilled holes.
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- Names of tools and equipment.  
*1 mark for each suitable tool or item of equipment.* (4 marks)

Naming tools and equipment  (4)	Jig and dolly. May be slip cast to mould and strap. Wooden modelling tools. Kiln. Glaze Transfers. Glaze and bucket.	Computer and printer. Die cutter, Craft Knife. Etc.	Soldering iron, wire cutters. Mould, vacuum former/ injection moulding machine.
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- Finishing techniques and processes clearly explained.  
*1 mark for each material, technique or process named.* (4 marks)

(iii) Finishing techniques and processes  (4)	Smooth with sponge. Greenware fired. Biscuit fire to 1000c. Glazed, glaze fire 1060-1160c.	Card insert cut and folded. Edges cut away and smoothed. Package assembled.	Edges filed/smoothed with wet and dry. Circuit placed into plastic base. Game assembled and checked.
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Understanding of health and safety issues with equipment named, clear understanding of the notion of risk and safe use clearly explained.

- Clear explanation showing understanding of the assessment of risk with a piece of relevant equipment* (4 marks)  
*Simply naming unrelated safety equipment with irrelevant explanation (goggles, apron, gloves).* (2 marks)

(b) Safety precautions	Wear protective clothing using kiln. Glaze powder may contain toxic chemicals wear face mask, goggles when necessary.	Care with electrical and cutting equipment. Use cutting matt and safety ruler.	Care with soldering iron in well ventilated area. Care with heat of plastic process used.
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**Total 22 marks**

<b>Teddy bear</b>	<b>Chocolate rolls</b>	<b>Picture Frame</b>	<b>Bus</b>	<b>Tractor</b>
Check and cut pattern. Pin to fabric and cut out pieces.	Prepare tins with liners or grease. Preheat oven 200c. Weigh ingredients.	Aluminium, Pewter, glass and card collected. Template, mould or pattern made.	Wood rough cut to size. Marked out detail.	Moulds made for injection moulding process.

Cut out fabric, pin and tack, remove pins, machine together leaving gap for stuffing. Stuff sewing gap by hand.	Mix dry ingredients in a bowl. Beat egg stir in oil and milk in another. Pour wet into dry ingredients and mix.	Frame may be cast or press formed. If cast mould is made metal heated and poured into mould. If press formed metal is pressed into shape, marked out and cut before edges smoothed.	Bus cut to size, holes drilled, edges smoothed with files. Axle holes drilled. Wheels made of plastic using injection moulding process.	All pieces made using injection moulding process with individual mould and dies for each coloured section. Edges smoothed with sprue removed.
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Pins, thread, needles. Sewing machine, Scissors.	Oven, tins, scales, mixing bowls, wooden spoon.	Mould, files, glass cutter, hack saw, wet and dry/emery cloth. Stanley knife, cutting matt.	Circular saw, Tennon saw, Drilling machine, drill bits. Marking knife. Paint and paint brushes or spray paint.	Moulds and dies for forming plastic in injection moulding process. Injection moulding machine.
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Cut loose threads. Add eyes and any other features required.	Pour mixture into tins. Cook 10-15 mins. Allow to cool to remove from tins. Spread cream and roll up. Melt chocolate and cover rolls.	Metal smoothed and polished. Glass cut to size and frame assembled.	Bus painted and wheels assembled. Final coating of varnish may be applied.	Tractor assembled.
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Care in using iron, scissors, pins etc. Care in using sewing machine.	Sell by dates of eggs and milk. Use oven gloves when needed.	Wear goggles when using machinery. Keep hair and loose clothing tied back. Gloves when handling hot metal.	Wear goggles when using machinery. Keep hair and loose clothing tied back.	Wear goggles when using machinery. Keep hair and loose clothing tied back. Gloves when handling hot plastic.
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**Question 3**

- (a) (i) e.g.
- British Standards Institute (BSI)
  - International Standards organisation (ISO)
  - European Union (CE)
  - British Electrotechnical approvals board (BEAB)
  - British Toy and Hobby Manufacturers Association (BTMA)
  - Food Standards Agency
  - Which. (1 mark)
- (ii) Protection may involve testing products for safety of use. May involve use of a quality mark etc.  
*2 marks for a full and correct explanation.*  
*1 mark for some understanding.* (2 marks)
- (b) (i) Indicates that a system known as ‘The Average system of weights and measures’ is being used. Accept references to small variations in weights or measures.  
*2 marks for a fully detailed and explained answer.*  
*1 mark for mentioning weight or measurement* (2 marks)
- (ii) e.g.
- The actual name of the product not just the brand name.
  - A list of materials or ingredients.
  - The appropriate durability indication.
  - Any special storage conditions or conditions of use.
  - The name and address of the manufacturer, packer or of a seller.
- Accept any 3 (3 x 1 mark).* (3 marks)
- (c) (i) The Kite mark is used to show customers/consumers that a product has passed safety and quality tests and will not cause the user injury. It conforms to British standards **safety tests**. (1 mark)
- (ii) Companies use this as a quality mark that suggests that their product has passed safety and quality tests. This is used to attract customers who may buy the product because they expect it to be safe. In turn the production of quality items gives a company a good reputation which will increase sales. (3 marks)  
*3 marks for a fully detailed and explained answer*  
*2 marks for a good answer with an important aspect missing*  
*1 mark for a basic understanding only.*
- (iii) e.g.
- The British toy and hobby association mark
  - The lion mark
  - The CE mark
  - An age warning
  - Warnings about safe use.
- Do not accept company logos.  
*Accept any 2 (2 x 1 mark).* (2 marks)

**Total 14 marks**



**Question 4**

(a) Manufacturing criteria evaluated would include:

- Physical properties of the material (strength, hardness, chemical resistance).
- Appropriateness for the manufacturing process and quantity production (moulding, forming).
- Aesthetic considerations such as colour, texture, shape.
- Environmental considerations such as ease of recycling.
- Cost and availability.
- Material form (sheet, rod, liquid).
- Safety such as flammability, safety of product and toxicity.
- Ease of use/Transport/Safety.

*Accept any three (3 x 1 mark)*

(3 marks)

(b) Advantages and disadvantages discussed may include those above with reference to:

<b>Package A</b>	<b>Package B</b>
Advantage: Safety when stored. Disadvantage: Not easily opened.	Advantage: Ease of display to show contents clearly. Disadvantage: May attract children's attention.
Advantage: Safe from contamination. Disadvantage: May be hard to get individual pills.	Advantage: Safe from contamination. Disadvantage: Hard to recycle as variety of materials used.
Advantage: Waterproof to protect contents. Disadvantage: Cannot see contents.	Advantage: Waterproof to protect contents. Disadvantage: Can be easily punctured leading to contamination.
Advantage: Easily labelled with instructions. Disadvantage: Label may come off leading to unidentified contents.	Advantage: Easily opened for use by adults. Disadvantage: Easy for children to open.
Advantage: Cheap to manufacture so no added cost.	Advantage: Cheap to manufacture so not added cost. Disadvantage: Need an outer card box for protection and transport.

1 mark for each correct advantage or disadvantage for each package

(4 marks)

**Total 7 marks**

**Question 5**

- (a) 1 mark for each correct specification point (3 x 1 mark), 1 mark for a correct explanation (3 x 1 mark):

Suitable size and theme for age of child, as this makes buying the card easier for the consumer.

Suitable for gender of child or not gender specific, as this increases the market for the card.

Must be well made and safe for a child, no sharp edges or small pieces. (6 marks)

- (b) ● **Quality/range of ideas**
- |  |         |           |
|--|---------|-----------|
| One vague idea.                                  | 1 mark  |           |
| A number of vague ideas.                         | 2 marks |           |
| Beginnings of a quality idea.                    | 3 marks |           |
| Quality ideas.                                   | 4 marks |           |
| Quality ideas showing some originality.          | 5 marks |           |
| Quality ideas original in approach or principal. | 6 marks | (6 marks) |
- **Notes**
- |                                  |         |           |
|----------------------------------|---------|-----------|
| Evidence of labelling.           | 1 mark  |           |
| Some attempt at explanation.     | 2 marks |           |
| A clear explanation of the idea. | 3 marks | (3 marks) |
- **Quality of sketches and use of colour**
- |  |         |           |
|--|---------|-----------|
| Some attempt has been made.                  | 1 mark  |           |
| Recognisable line drawings.                  | 2 marks |           |
| Quality line drawing with some use of colour | 3 marks |           |
| Quality shaded drawings that use colour well | 4 marks | (4 marks) |
- (c) ● **Quality of design**
- |   |         |           |
|---|---------|-----------|
| Little evidence of a workable solution.                       | 1 mark  |           |
| Some evidence of a workable solution.                         | 2 marks |           |
| Workable solution.  | 3 marks |           |
| Good workable solution. (evidence of 3D nature of card)       | 4 marks |           |
| Very good workable and imaginative solution.                  | 5 marks |           |
| Excellent accurately drawn imaginative and workable solution. | 6 marks | (6 marks) |
- **Layout of information**
- Information must include front, inside and back for full marks. Maximum of two marks for 2D card.
- |  |         |           |
|--|---------|-----------|
| Only one or two pieces of information included.  | 1 mark  |           |
| Some information included but not well laid out. | 2 marks |           |
| Information correctly laid out.                  | 3 marks |           |
| Information correctly and well laid out.         | 4 marks | (4 marks) |
- **Relationship to specification points given in part (a)**
- |                                       |         |           |
|---------------------------------------|---------|-----------|
| Little evidence of specification use. | 1 mark  |           |
| Some evidence of specification use.   | 2 marks |           |
| Most specification points used.       | 3 marks |           |
| All specification points well used.   | 4 marks | (4 marks) |

**(d) Evaluation against specification**

No reference to specification.	1 mark	
Some reference to specification, but only vague detail.	2 marks	
A working evaluation with some detail.	3 marks	
A well structured evaluation showing detailed understanding. <i>Must suggest improvements for full marks.</i>	4 marks	(4 marks)

**(e) Accept any 2 of the following production stages (2 x 1 marks).**

- Printing also accept embossing or specific printing techniques.
  - Cutting with the use of press knives or die cutting.
  - Folding.
  - Packaging
  - May refer to badge production.
- (2 marks)

**(f) Clear description of one of the production stages named in part (e) with sequence correct.**

An attempt made.	1 mark	
Some basic knowledge of the process is shown.	2 marks	
A recognisable attempt but some information missing.	3 marks	
A clear description but may have some information missing.	4 marks	
A clear and accurate description of process and equipment.	5 marks	(5 marks)

**Total 44 marks**

**Question 6**

- (a) Explanation of the advantages of using CAD in the design of prototypes, e.g.

Using CAD means that elements of the design can be tested before they are made.

Different fonts or colours can be used

Sizes can be changed easily

Different elements of a design can be brought together, (pictures, photographs, bar codes and printed information).

Designs can be easily saved and used when needed.

Designs or parts of a design can be electronically communicated across large distances.

*Accept any 4 of the above points (4 x 1 mark).*

(4 marks)

- (b) Explanation of the advantages of using CAM in the production of prototypes, e.g.

Designs are produced on computer and then sent directly to a machine to be made.

The computer tells the machine what shapes to cut out and print.

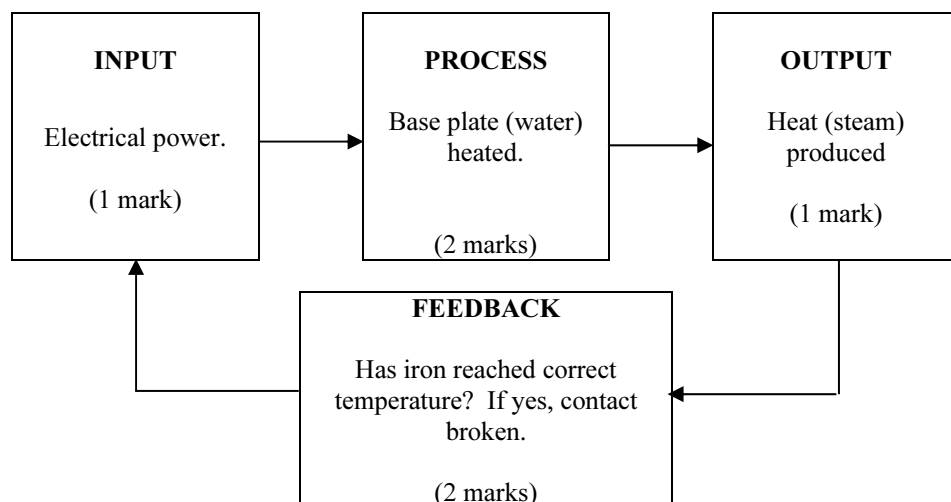
Machines can fold card, put tops on bottles, assemble components.

Workers do not need to get injured using dangerous machinery.

(4 marks)

*Accept any 4 of the above points (4 x 1 mark).*

**Total 8 marks**

**Question 7**

1 mark for correct input and output.  
2 marks each for correct process and correct feedback.

(6 marks)  
**Total 6 marks**

**Question 8****(a) (i) Market pull:**

Consumers decide they need a product and it is developed as a result.

Consumers create demand but manufacturers can help fuel this.

Developments in mobile phones and text messaging services illustrate this principal.

Simple explanation with no detail or understanding	1 mark	
An explanation that shows some understanding	2 marks	
A detailed explanation showing full understanding	3 marks	(3 marks)

**(ii) Technological push:**

Picture messaging has been developed without any real demand from consumers who have been slow to adopt the technology in this country. This is more concerned with products developed as a result of scientific research and development which involves selling a new product to consumers.

Simple explanation with no detail or understanding	1 mark	
An explanation that shows some understanding	2 marks	
A detailed explanation showing full understanding	3 marks	(3 marks)

**(b) (i) Market pull products e.g.**

The first automobiles and telephones were developed because of human need. As were the first music recording facilities such as record and tape players.

Product named correct but showing no understanding	1 mark	
Correct product named show full understanding	2 marks	(2 marks)

**(ii) Technological push products e.g.**

The introduction of Teflon and microwave oven technology are also examples of technological push. The Sony walkman was only developed when the manufacturers decided that people would like to listen to music on the move. CDs were introduced as a result of technological developments but they are now common place.

Debatable product named correct	1 mark	
Complete correct product named	2 marks	(2 marks)

**Total 10 marks****TOTAL MARKS FOR PAPER 125**