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GCSE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Design and Technology: Product Design
(3544 – Foundation)

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ASSESSMENT and QUALIFICATIONS ALLIANCE

GENERAL CERTIFICATE OF SECONDARY EDUCATION

June Examination 2004

DESIGN AND TECHNOLOGY: PRODUCT DESIGN

FOUNDATION TIER

Question 1

(a) e.g.
- Packaging is often thrown away becoming litter.
- Composites that are difficult to recycle are often used.
- Packaging is light but large, containing little weight of material so is not cost effective to recycle but causes land fill problems because of its size.
- Thrown away materials/litter often causes damage to wildlife and is unpleasant around houses.

2 marks for a fully explained answer
1 mark for showing some understanding (2 marks)

(b) Renewable materials are those that can be replaced, e.g. accept resources such as trees which can be replanted. Do not accept renewable energies.

2 marks for a fully explained answer
1 mark for showing some understanding (2 marks)

(c) Non-renewable materials are those that cannot be replaced. Aluminium is a metal that will run out as metals are mined and mines eventually become worked out. Not 're-cycling'.

2 marks for a fully explained answer
1 mark for showing some understanding (2 marks)

(d) Recycling problems may include:

- Must be empty and clean.
- Collecting materials for recycling.
- Persuading individuals to collect and sort materials.
- Sorting or separating materials.
- Cost of energy for recycling.
- Cost of recycling.

Accept any two of the above (2 x 1 mark) (2 marks)

Total 8 marks

Question 2

(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, conductive wire 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 shiny 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 named attractive feature. (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 12 marks

Question 3

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

	Plate	**Packaging**	**Steady hand game**
(i) Preparation of materials One mark for some indication of materials / components / ingredients (4)	Wedge clay. Place on centre of wheel Line up jig and dolly. Accept slip casting. Prepare mould etc.	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 (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 poured into mould. After 15 mins. Excess slip 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.

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.

Finishing techniques and processes clearly explained.
1 mark for each material, techniques and 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.

Understanding of safety precaution's with equipment named, with safe use clearly explained.
1 mark for each safety issue raised (2 x 1 mark). (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.

Clear understanding of quality control issues with two checks clearly explained.
Award 1 mark for each quality control check (2 x 1 mark).
Award 1 mark for each explanation (2 x 1 mark). (4 marks)

(c) Quality control checks	Check clay has no air bubbles. Visual check of shape, may use callipers to check diameter. Visual check of glaze and decoration. Kiln temperature.	Check clarity of printing and colour. Quality of die cutter before use.	Check circuit works. Check mould before forming plastic and resultant shape. Final check working.

Total 24 marks

Teddy bear	**Chocolate rolls**	**Picture Frame**	**Bus**	**Tractor**
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.
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.
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.
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.
Check all seams. No loose threads. No loose parts that can be easily pulled away.	Ensure all mixture is combined with no lumps. When cooked top springs back when pressed gently.	All sections securely fixed together. No rough edges.	All sections securely fixed together. No rough edges.	All sections securely fixed together. No rough edges.

Question 4

(a) (i) British standard kite mark. BSI / British Standard Institute (1 mark)

(ii) 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.
2 marks for a full and correct explanation.
1 mark for some understanding. (2 marks)

(b) 1 Not suitable for children under 3 years as may contain small parts that can cause choking.

2 Symbol to encourage recycling. Specific to recycling paper or card but accept 'recycling symbol to encourage people to be environmentally friendly'.

3 Bar code for electronic sale. The bar code is used to control stock to ensure shops do not run out of items and do not sell out of date stock.
2 marks each for a correct reason (3 x 2 marks). (6 marks)

Total 9 marks

Question 5

(a) Two correct requirements relating to function.
(2 x 2 marks) e.g. top is easy to open. (4 marks)

(b) Average size of child's hand. (1 mark)
More detailed information about a child's grip or size of fingers and thumb. (2 marks) (2 marks)

(c) (i) Award maximum of 6 marks for aesthetics.

Very simple basic attempt at sketch or written explanation of product.	1 mark	
Some attempt at sketch or written explanation of product.	2 marks	
Recognisable attempt at sketch or written explanation of product.	3 marks	
Recognisable sketch or written explanation of acceptable product using colour.	4 marks	
Clear sketch or written explanation of aesthetically well modified product using colour.	5 marks	
As above showing flair and imagination.	6 marks	(6 marks)

(ii) Award maximum of 6 marks for ergonomics.

Very simple basic attempt to change shape of product.	1 mark	
Recognisable attempt changing shape to fit one aspect of a child's needs.	2 marks	
As above with clear understanding shown.	3 marks	
Good attempt to change shape with two ergonomic features considered.	4 marks	
As above showing clear detail and understanding.	5 marks	
Clear understanding with ergonomic considerations well met.	6 marks	(6 marks)

(d) Suitable test correctly named e.g. questionnaire, comparison with sales figures (2 x 1 mark).
Correct description of testing processes (2 x 2 marks). (4 marks)

Total 22 marks

Question 6

(a) 1 mark for each correct specification point as below:

Suitable size and theme for age of child.
Suitable for gender of child or not gender specific.
Must be well made.
Must be safe for a child, no sharp edges or small pieces.
Cost not to be rewarded (4 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.	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) Accept any 2 of the following production stages (2 x 1 mark).

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

(e) Clear description of one of the production stages named in part (d) 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 processes and Equipment.	5 marks	(5 marks)

Total 38 marks

Question 7

(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.

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

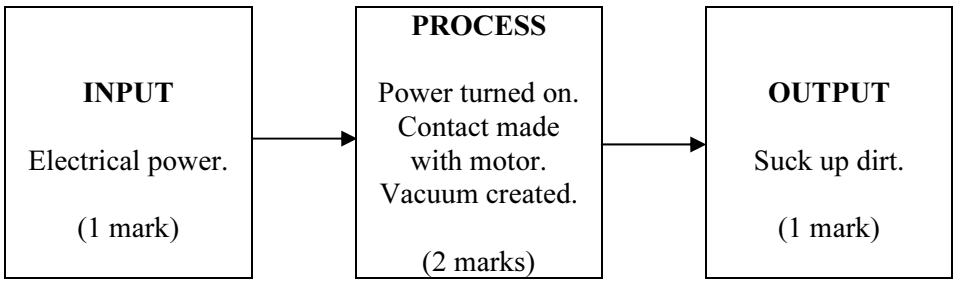
Total 8 marks

Question 8

Correct information

Only one piece of correct information included.	1 mark
Two correct pieces of information included.	2 marks
Three pieces of correct information.	3 marks
Correct information in appropriate order/sequence.	4 marks

e.g.



(4 marks)
Total 4 marks

TOTAL MARKS FOR PAPER 125