

MARKSCHEME

May 2003

DESIGN TECHNOLOGY

Higher Level

Paper 2

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If you do not have a copy of the current Design Technology Guide,
please request one from IBCA.

General Marking Instructions

*After marking a sufficient number of scripts to become familiar with the markscheme and candidates' responses to all or the majority of questions, Assistant Examiners (AEs) will be contacted by their Team Leader (TL) by telephone. The purpose of this contact is to discuss the standard of marking, the interpretation of the markscheme and any difficulties with particular questions. It may be necessary to review your initial marking after contacting your TL. **DO NOT BEGIN THE FINAL MARKING OF YOUR SCRIPTS IN RED INK UNTIL YOU RECEIVE NOTIFICATION THAT THE MARKSCHEME IS FINALISED.** You will be informed by e-mail, fax or post of modifications to the markscheme and should receive these about one week after the date of the examination. If you have not received them within 10 days you should contact your Team Leader by telephone. Make an allowance for any difference in time zone before calling. **AEs WHO DO NOT COMPLY WITH THESE INSTRUCTIONS MAY NOT BE INVITED TO MARK IN FUTURE SESSIONS.***

You should contact the TL whose name appears on your 'Allocation of Schools listing' sheet.

Note:

Please use a personal courier service when sending sample materials to TLs unless postal services can be guaranteed. Record the costs on your examiner claim form.

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1. Follow the markscheme provided, do **not** use decimals or fractions and mark only in **RED**.
2. Where a mark is awarded, a tick (✓) should be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark.
3. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases write a brief annotation in the **left hand margin** to explain your decision. You are encouraged to write comments where it helps clarity, especially for moderation and re-marking.
4. Unexplained symbols or personal codes/notations on their own are unacceptable.
5. Record subtotals (where applicable) in the right-hand margin against the part of the answer to which they refer (next to the mark allocation for Section A). Do **not** circle sub-totals. **Circle the total mark for the question in the right-hand margin opposite the last line of the answer.**
6. For Section B, show a mark for each part question (a), (b), *etc.*
7. Where an answer to a part question is worth no marks, put a zero in the right-hand margin.
8. Section A: Add together the total for each question and write it in the Examiner Column on the cover sheet.
Section B: Insert the total for each question in Examiner Column on the cover sheet.
Total: Add up the marks awarded and enter this in the box marked TOTAL in the Examiner Column on the cover sheet.
9. After entering the marks on the cover sheet check your addition to ensure that you have not made an error. Check also that you have transferred the marks correctly to the cover sheet. **We have script checking and a note of all clerical errors may be given in feedback to examiners.**
10. Every page and every question must have an indication that you have marked it. Do this by **writing your initials** on each page where you have made no other mark.
11. If a candidate has attempted more than the required number of questions within a paper or section of a paper, mark only the required number of questions in the order in which they are presented in the paper, unless the candidate has indicated the question(s) s/he wants to be marked on the cover sheet.
12. A candidate can be penalized if he/she clearly contradicts him/herself within an answer. Make a comment to this effect in the left hand margin.

Subject Details: Design Technology HL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in Section A (total 40 marks) **ONE** question in Section B [20 marks]. Maximum total = 60 marks.

General

A markscheme often has more specific points worthy of a mark than the total allows (especially for essay questions). This is intentional. Do not award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each marking point has a separate line and the end is signified by means of a semicolon (;).
- An alternative answer or wording is indicated in the markscheme by a '/'; either wording can be accepted.
- Words in (...) in the markscheme are not necessary to gain the mark.
- The order of points does not have to be as written (unless stated otherwise).
- If the candidate's answer has the same 'meaning' or can be clearly interpreted as being the same as that in the mark scheme then award the mark.
- Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalising them for what they have not achieved or what they have got wrong.
- Remember that many candidates are writing in a second language; be forgiving of minor linguistic slips. Effective communication is more important than grammatical niceties.
- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalised. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded. Indicate this with '**ECF**', error carried forward.
- Units should always be given where appropriate. Omission of units should only be penalised once. Indicate this by '**U-1**' at the first point it occurs. Ignore this, if marks for units are already specified in the markscheme.
- Do not penalise candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

SECTION A

1. (a) (i) *Award [1] for any advantage of using tiles over chopped bark.*
easier to keep clean;
better hygiene;
more even;
more aesthetically pleasing;
stays in place/does not blow away/can't be thrown around, therefore
more reliable safety surface;
does not soak up water in wet weather;
children stay cleaner when playing on it;
children might choke on chopped bark; **[1 max]**
- (ii) *Award [1] for Tile 1 OR 33 mm tile thickness.* **[1 max]**
- (iii) *Award [1] for correct calculation and [1] for correct answer, including units:*
i.e. railing 700 mm;
height of slide/sensible guesstimate of height of slide; **[2 max]**
- (b) (i) cost – thinner tiles are cheaper so using some thinner tiles would reduce the cost; **[1 max]**
- (ii) to use a combination of tiles would require the stone base to be produced accurately to two different heights as well as being flat;
it would require more complex work / increased labour costs to achieve this;
it would take longer to produce two levels;
it is much easier to make the surface flat and at the same level; **[3 max]**
- (c) (i) *Award [1] for an appropriate test and award [1] for a brief explanation.*
performance test;
simulates the fall, rather than using children to test;
provide good data for comparative evaluations; **[2 max]**
- (ii) *Award [1] for each correct answer from the list.*
performance tests can be time-consuming;
performance tests can be costly to perform;
it is important to ensure that the test corresponds well to the real scenario; **[2 max]**
- (d) (i) *Award [1] for each correct reason.*
more durable/not likely to tear or split;
less prone to vandalism;
better coefficient of friction;
easier to maintain;
takes a higher load;
environmentally acceptable; **[2 max]**
- (ii) to give the slide enhanced stiffness/rigidity;
and thus to ensure that the slide does not bend/sag/crack during use (but retains its appropriate angle and functions as a slide); **[2]**

- (e) (i) *Award [1] for calculation and [1] for correct answer.*
FoS = 250/50
= 5 (*FoS is a ratio therefore no units required*);
minus [1] if units are included. **[2]**
- (ii) *Award [1] for example of misuse and [1] for a brief explanation.*
possible use by more than one child;
which would exceed normal maximum load;
possible use by heavier people (*e.g. teenagers*);
parks are open places so accessible to all members of public;
shock loading, *e.g. by being jumped on*; **[2 max]**

2. (a) *Award [1] for any of the following advantages:*
no finishing required;
volume production method;
hollow shapes are produced; **[1 max]**
- (b) *Award [1] for each stage in converting extruded metal tubing into railings.*
cut to length by wasting (sawing);
joined by fusing/welding;
finished by enamelling or painting or other appropriate method; **[3 max]**

N.B. Some candidates may read question as how extrusion is undertaken.
molten metal;
material pushed through die and cooled;
cold metal tube out;

3. (a) *Award [1] for a definition to the effect of:*
a robot vehicle that moves over a shop floor guided by control system using painted lines/IR rays/cables laid beneath the surface;
Award [0] for just robot vehicle. **[1]**
- (b) *Award [1] for each distinct point in the explanation.*
AGVs can move components or finished products around the factory/lift heavy things;
they minimize the need for human operators and thus reduce labour costs;
they are co-ordinated with other aspects of the production system to maximize efficiency;
works 24/7 without getting tired; **[3 max]**

4. (a) *Award [1] for a definition to the effect of:*
dramatic change/completely new product (is devised by going back to the roots of a problem and thinking about a solution in a different way)/not like anything before/novel solution; *[1]*
- (b) *Award [1] per distinct point.*
most products are based on previous designs with subtle/small/trivial changes;
may be radical in some way;
e.g. new materials/new technology/new concept; *[3 max]*

5. (a) *Award [1] for a definition to the effect of:*
a measure of the fractional increase in dimensions (length, area or volume)
(per Kelvin increase in temperature) when an object is heated; **[1]**
- (b) *Award [1] for identifying an appropriate design context and [1] for reference to change in dimension and [1] for reference to change in temperature.*
e.g. oven door - glass and metal;
large temperature changes during use of even but two materials need to remain joined;
it is important that the thermal expansion of the two materials are similar so they expand at the same rate; **[3 max]**
6. (a) *Award [1] per correct item from list below.*
low salt;
low cholesterol/low fat;
high fibre;
high protein; **[2 max]**
- (b) *Award [1] per distinct point in a brief explanation.*
growing a fungus on grain and paper flour wastes;
it is produced by fermentation in the absence of air;
pH and temperature are carefully controlled;
mycoprotein is harvested as a mass of threads (mycelium); **[2 max]**

SECTION B

7. (a) (i) *Award [1] for a definition to the effect of:*
the permanent deformation of a solid subjected to stress; **[1 max]**
- (ii) elastic strain – material returns to original size and shape when stress is removed;
plastic strain – material remains plastically deformed when the stress is removed; **[2]**
- (iii) *Award [1] for appropriate reason and [1] for a brief explanation.*
good corrosion resistance;
therefore can operate in damp environment where cannot be protected with finishes;
non-porous, easily cleanable surface;
therefore hygienic;
attractive finish;
polished untreated metallic surfaces are popular stylistically; **[2 max]**
- (b) (i) material with a low thermal conductivity will be an effective insulator;
and thus once cool, less energy will be required to maintain a low temperature; **[2 max]**
- (ii) *Award [1] for literature search and [1] for a brief explanation*
(e.g. using Internet or manufacturers data books). **[2 max]**

- (c) (i) *Award [1] for an appropriate way and [1] for a brief explanation.*
compares appliance with similar appliances (and shows relative efficiency on scale A to G);
so customer can see where the appliance is in its “class”;
shows actual energy consumption when being used in a particular way;
so customer can see how much energy will be used;
shows how noisy the appliance is;
so customer can determine appropriateness for location of use; **[2 max]**
- (ii) *Award [1] for each distinct point*
both fashion and planned obsolescence result in product replacement;
fashion has a very unpredictable effect on product replacement;
planned obsolescence results in more predictable product replacement;
the consumer declares the product obsolete in fashion;
due to peer group pressure;
the influence of media icons;
different styles or trends;
the manufacturer builds in obsolescence, e.g. through the use of less durable materials in planned obsolescence;
- both fashion and planned obsolescence lead to increased product manufacture resulting in increased consumption of:
natural resources;
energy;
pollution;
both fashion and obsolescence lead to increased disposal of products;
unless recyclable materials are used then ultimately disposal of the product will result in waste;
if recycled materials are used then this will reduce the waste for landfill sites or incineration;
replacement products may be less polluting than the replaced products;
e.g. quieter to run;
or use less energy; **[9 max]**

8. (a) (i) different materials – lignin fibres and cellulose matrix;
combined to form composite materials; [2]
- (ii) *Award [1] for an appropriate material.*
e.g. glass-reinforced plastic (GRP);
carbon-reinforced plastic (CRP);
fibre glass;
plywood; [1 max]
- Award [1] for a brief explanation.*
e.g. more durable;
less maintenance;
can form complicated shapes easily;
very strong;
cheaper; [1 max]
- (b) (i) *Award [1] for a definition to the effect of:*
limited volume production (a set number of items to be produced). [1 max]
- (ii) *Award [1] for an appropriate advantage and [1] for a brief explanation.*
cost;
no massive capital costs;
as would be for automation;
flexibility of skills of labour force;
lead to a flexible production system;
flexibility;
capable of customization according to client needs;
more jobs;
higher employment supports local economy;
more accurate production;
can make duplicates easily;
more labour intensive than automation;
so impacts on employment;
less labour intensive than craft;
so impacts on employment/number of jobs;
volume of production;
boats would be produced in limited volume;
faster than craft;
reduces production time; [2 max]
- (iii) *Award [1] for an appropriate impact and [1] for a brief explanation.*
different skills required to work with different materials;
so retraining issues;
different equipment required;
so costs for new equipment and old equipment redundant;
different working practices required;
could lead to some redundancy; [2 max]

- (c) (i) *Award [1] for an appropriate property and [1] for a brief explanation.*
it is difficult/costly to separate the component materials;
as the component materials have widely different properties;

OR

it is difficult/costly to separate the component materials;
therefore it can only be recycled as a composite; **[2 max]**

- (ii) Repair

Wooden boats: *[1] for an appropriate point and [1] for a brief explanation.*
need regular repair and maintenance;
parts can be replaced easily; **[2 max]**

Composite boats: *[1] for an appropriate point and [1] for a brief explanation.*
lower maintenance;
difficult to repair;
more advanced technology required; **[2 max]**

Recycle

Wooden boats: *[1] for an appropriate point and [1] for a brief explanation.*
parts can be reused;
parts can be made into other wooden products;
parts can be recycled as paper;
can be burnt as fuel; **[2 max]**

Composite boats: *[1] for an appropriate point and [1] for a brief explanation.*
recycling potential minimal;
landfill disposal only option; **[2 max]**

Award [1] for Balancing Statement. **[1]**

9. (a) (i) *Award [1] for a definition to the effect of:*
the direct introduction of molten plastic under pressure into a die which
cools (rapidly) to allow the formed object to be released from the
mould. *[1]*
- (ii) *Award [1] per distinct correct advantage.*
no finishing required;
volume production/batch method;
low cost;
can use different moulds to produce different products on the same
injection moulding machine;
no drying time/short cycle time; *[2 max]*
- (iii) *Award up to [2] for an appropriate explanation, [1] per distinct point.*
the mould, which is a negative of the finished product, is produced by
one-off production;
one-off production of the mould precedes the volume production
process; *[2 max]*
- (b) (i) alternative low technology solution to produce an equivalent product;
replacing sophisticated high technology;
- OR**
- alternative/low technology/renewable energy source;
replaces non-renewable/high technology energy sources; *[2]*
- (ii) papier-mâché carton production would be appropriate to its context plus reason;
- OR**
- it would be low in capital costs;
therefore cheap to implement;
- OR**
- would use local materials;
so reduces transport costs;
- OR**
- would involve decentralised energy sources plus reason;
- OR**
- would not be detrimental to the environment;
as it uses recycled material/would reduce the volume of landfill
produced on disposal; *[2 max]*

- (c) (i) *Award [1] for an appropriate way and [1] for a brief explanation.*
- reducing wastage of materials;
 - no wastage of materials as in wasting (cutting and machining or abrading);
 - minimizing pollution;
 - by using clean (renewable) energy sources;
 - conservation of natural resources;
 - use of recycled materials;
 - minimizes energy wastage;
 - only material used is heated;

[2 max]

- (ii) *Award [1] per distinct correct point.*

- using energy more efficiently can save money;
- using raw materials more efficiently can save money;
- low energy requirement;
- low capital costs;
- biodegradable;
- easily recyclable materials (e.g. paper can be cheaper);
- paper can be obtained from recycled products;
- no pollution;
- little waste;
- leads to increased profits;
- different scales of production;
- enhances public image;
- meets consumer demand for greener products;
- maximum levels of pollution and waste are agreed internationally;
- legislation policed by monitoring through collection of quantitative data;
- demonstrates corporate responsibility;
- anticipates future legislation for greener products;
- contravention of legislation results in fines being imposed;
- legal action can result in negative public image;
- green image can enhance public image of company;
- consumer pressure for greener products;
- CFCs that used to be in polystyrene can damage ozone layer;

[9 max]
