

# **MARKSCHEME**

**May 2003**

## **DESIGN TECHNOLOGY**

**Higher Level**

**Paper 3**

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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 FINALIZED.** 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. Indeed, another examiner may have arrived at the opposite decision. 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. Do **not** circle subtotals. Circle the total mark for the question in the right-hand margin opposite the last line of the answer.
6. Where an answer to a part question is worth no marks, put a zero in the right-hand margin.
7. For each Option: Add together the totals for each question in the Option and write it in the 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.
8. After entering the marks on the cover sheet check your addition of all marks to ensure that you have not made an arithmetical 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 all examiners.**
9. 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.
10. If a candidate has attempted more than the required number of Options within the paper, mark only the required number of Options in the order in which they are presented in the paper and ignore any excess material, regardless of its quality. Make a comment to this effect in the left hand margin.
11. 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 3 Markscheme

### Mark Allocation

Candidates are required to answer **ALL** questions in each of **TWO** Options (total **[20 marks]**). Maximum total = **[40 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 penalized. 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 penalized 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 penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

**Option D – Food technology**

- D1.** (a) *Award [1] for identifying appropriate lifestyle factor and [1] for brief explanation.*  
employment status, *e.g.* working women pressure on time no time;  
to bake bread traditionally so bread-maker enables home baked bread without all the hassle;  
health consciousness;  
the bread-maker enables people to make bread according to their favourite health recipes;  
reduced mobility;  
people can have fresh bread daily without going to shops;  
leisure activities;  
lots of people like cooking as a leisure activity, the bread- maker enables people to experiment with different recipes;  
back to basics;  
the bread-maker allows bread-making at home;  
technophiles love buying gadgets; **[2 max]**
- (b) *Award [1] per distinct point.*  
the bread-maker enables the one-off production of a loaf (it is effectively automated craft production);  
the crust of the bread is likely to be chewier and the texture will be less uniform than for mass produced bread;  
designer breads can be produced with a range of flavours and textures, *e.g.* walnut bread, banana bread; **[2 max]**
- (c) *Award [1] per distinct point.*  
bread is rich in carbohydrates and vitamins;  
but it is not a complete food/cannot just eat bread alone;  
as it must be complemented with other (with protein rich foods and protective foods); **[3 max]**
- D2.** low dietary fibre intake is implicated in a number of diseases common in developed countries, *e.g.* constipation, large bowel cancer;  
eating foods rich in dietary fibre, *e.g.* brown rather than white bread, vegetables and fruit reduces the risk of these diseases; **[2 max]**
- D3.** *Award [1] per distinct point plus [1] for brief explanation.*  
preventing contamination of bread;  
through good hygiene standards;  
preventing contamination of bread;  
food packaging;  
preventing microbial growth;  
through maintaining product in cool conditions;  
killing microorganisms; through use of irradiation;  
preventing food spoilage;  
through use of additives; **[2 max]**

- D4.** Award [1] per distinct point in brief explanation, up to [4] for undernourishment and up to [4] for undernutrition plus [1] for a balanced answer.

*undernourishment*

is chronic food insecurity in which food intake is insufficient to meet basic energy requirements on an ongoing basis;

is estimated from existing data about numbers of people and the amount of food available to them;

the energy available from local food production, trade and stocks gives total calories;

the minimum energy requirement for the whole population based on energy requirements of different age and gender groups and the proportion of the population each group represents is calculated;

the total number of calories is divided by the number of people in the population;

a coefficient of distribution is factored in to take account of inequality of access to land;

from this the percentage of the population whose food intake falls below the minimum requirement can be calculated;

multiplying by the size of the population gives the number of undernourished people;.

*undernutrition*

results from prolonged low levels of food intake and/or poor absorption of food consumed leading to wasting, stunting or underweight, reduced cognitive ability, poor health status and low productivity;

is determined from weight, height and age data;

the ratio of these measurements to normal percentile ranges;

indicates the outcome of inadequate food intake and other factors;

*e.g.* poor health and poor sanitation;

**[9 max]**

**Option E – Computer aided design, manufacture and production**

- E1.** (a) CAD software running on a PC = CAD, using the PC to control the embroiderer = CAM;  
the serial/parallel/USB interface/optical fibre/infrared connections on the PC can be used to connect CAD to CAM to produce CAD/CAM system; **[2 max]**
- (b) *Award [1] for input device and [1] for brief explanation.*  
a scanner is an input device;  
pictures, logos, etc. can be scanned into a computer programme and modified as necessary to output them in embroidered form; **[2 max]**
- (c) *Award [1] per distinct relevant point within the explanation.*  
the frame ensures accurate alignment of different parts of the embroidered pattern;  
and dramatically reduces the effects of fabric stretch;  
so that designs can be reproduced accurately on the fabric;  
the frame provides points of reference for the embroiderer/x and y coordinates to achieve the design; **[3 max]**
- E2.** *Award [1] per distinct point.*  
production to order with materials being supplied Just-in-time;  
saves on storage space;  
reduced capital investment;  
as capital is not tied up in unused raw materials or unsold products; **[2 max]**
- E3.** *Award [1] per distinct point.*  
quality control built into the system, e.g. with sensors;  
feedback from control system can indicate error;  
machines automatically shut down on error;  
feedback can say if CAD is feasible;  
more intricate/detailed designs are possible;  
more advanced technology is used which promotes research and development; **[2 max]**



**E4.** *Award [1] for each distinct correct point, up to [3] for each strategy.*

design for materials;

design in relation to the materials during processing;

it relates to designing the product so that particular materials can be used for manufacture;

*e.g.* plastics or metals;

design for process;

design products in a way that matches an existing manufacturing process;

*e.g.* injection moulding;

it is cheaper to do injection moulding if one is set up for injection moulding already;

the product could be designed so that it appropriately uses the existing skills of the workforce;

design for assembly;

minimizing the number of parts;

using standard components;

designing parts which are multifunctional or for multiuse;

designing parts for ease of fabrication – component to component, components into sub-assemblies, sub-assemblies into products;

**[9 max]**

**Option F – Invention, innovation and design**

- F1.** (a) *Award [1] for each distinct point.*  
the Walkman was a new product/radical design;  
there was no previous comparable product to imitate;  
there was no established market; *[3 max]*
- (b) *Award [2 max] for an appropriate outline.*  
many aspects of the design are the same or similar to what went before;  
difference is hidden technology; *[2 max]*
- F2.** Akio Morita, as Sony founder and honorary chairman, was an influential individual within the Sony organization;  
who had an enthusiasm for the Sony Walkman™ design;  
he pushed his idea against skeptical colleagues;  
he believed in his own vision; *[2 max]*
- F3.** for re-innovation products and processes are constantly redesigned;  
this can overcome weaknesses in design;  
can make products more commercially viable;  
can incorporate new technologies; *[2 max]*
- F4.** scientific creates new opportunities *e.g.* materials, processes;  
science is then incorporated into marketable products;
- Or can achieve marks using a specific example:*  
*e.g.* laser technology (science);  
can be applied to the development of medical products (innovation); *[2 max]*

**F5.** Award [1] for each of two distinct ways of segmenting markets [2]. Then [1] per distinct point for each of two ways in which markets can be segmented [1] for balanced answer.

markets can be segmented in a number of different ways *e.g.* income;  
age;  
lifestyle;  
geographical location / country;  
gender;  
developed / developing countries;  
technological competence;

a basic product will be cheaper and more affordable for lower income groups;  
whereas less basic product may be produced for higher income groups;  
cars for example have more or less features depending on the target market segment;  
texture and taste of food products are designed to meet the needs of different age segments;  
older people have very different tastes from young children or teenagers or young adults;  
novelty food products, *e.g.* snack products and ice cream, may be targeted at children;  
colour is important, *e.g.* for children's toys, or to meet fashion;  
age is probably a major consideration in market segmentation for many products;  
it is important to be aware of the capabilities of different age groups;  
designing products for use by a wide age range, *e.g.* seating in parks, can be a problem;  
lifestyle factors, *e.g.* leisure activities or working patterns, can lead to market segmentation;  
leisure goods often targeted towards particular segments, *e.g.* trainers, clothing;  
products are designed for specific geographical locations in line with legal requirements;  
and customs/cultural influences;

**[9 max]**

**Option G – Health by design**

- G1.** (a) *Award [1] per distinct point for appropriate explanation.*  
the hearing aid shell (have been typically hard shells and) must fit the ear of the individual user perfectly;  
each ear is individual so the shell is made through moulding which is one-off production; *[2 max]*
- (b) *Award [1] for an appropriate disadvantage plus [1] for brief explanation.*  
if a person wears glasses;  
a BTE aid would be unsuitable;  
if a person has difficulty handling small objects, *e.g.* due to arthritis;  
a BTE aid would be most suitable;  
it is very visible;  
many people do not like to admit they need a hearing aid; *[2 max]*
- (c) *Award [1] per distinct relevant point.*  
smaller hearing aids are placed in the ear canal and thus closer to the ear drum;  
the closer the aid is to the drum the less amplification is required;  
less amplification means less drain on battery and thus extends battery life; *[3 max]*
- G2.** *Award [2] for appropriate outline.*  
new materials;  
better optical quality;  
increased comfort rating;  
more efficient for volume production;  
can meet the needs of different target markets;  
cheaper manufacture therefore more acceptable price for contact lenses; *[2 max]*
- G3.** *Award [2] for appropriate outline.*  
synthetic vascular prostheses have physical and chemical properties similar to real arteries;  
using sythetic materials removes the need for autografts and thus material would not have to be removed from another part of the body giving the person two problems rather than the initial one; *[2 max]*

- G4.** Award [1] for each distinct relevant point, up to [3] for clean fuels, up to [3] for improved stove design and up to [3] for implications for health. It is equally valid if candidates take a developed world perspective on the three parts of the question.

*clean fuels*

some people in developing countries depend on biomass fuels for cooking and heating;  
burning biomass fuels produces large amounts of smoke;  
and other air pollutants in the confined space of the home;  
exposure to pollutants is often far higher indoors than outdoors;

*improved stove design*

improved stove design can ensure better removal of smoke from the house through a flue or chimney;  
as well as achieving improved fuel efficiency;  
improved stove design should be seen as an interim solution in the transition to less polluting and more efficient liquid fuels – such as kerosene and liquefied petroleum gas (LPG) – and electricity;

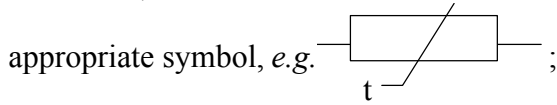
*implications for health*

the World Bank has designated indoor air pollution in developing countries as one of the four most critical global environmental problems;  
indoor air pollution weakens the body's defences;  
it can damage lungs and can contribute to a range of acute lower respiratory conditions and related conditions;  
*e.g.* chronic lung disease, asthma, low birth weight and heart disease;

**[9 max]**

**Option H – Electronic products**

**H1.** (a) thermistor;



[2 max]

(b) 50 % cool;  
50 % warm;

[2 max]

(c) Award [1] for each correct point.

two rules will “fire up”, i.e. the one for temperature is cool and the one for temperature is warm;

the rules will be defuzzified by an appropriate method, e.g. centre of gravity;

this will give a crisp output value for the heater;

[3 max]

**H2.** Award [1] for each distinct correct point in a brief explanation.

adding impurities to a semiconductor material such as silicon or germanium will alter the way in which current flows through the material;

addition of elements (e.g. As, P, Sb) with five valence electrons;

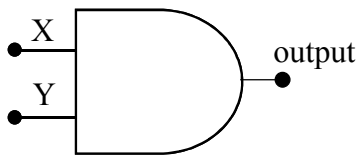
creates an n-type semiconductor;

addition of elements with three valence electrons (e.g. B, Al, In and Ga);

will create a p-type semiconductor;

[2 max]

**H3.** Award [1] for the diagram and [1] for the truth table (order of lines relevant).



X	Y	output
0	0	0
0	1	0
1	0	0
1	1	1

[2 max]

**H4.** *Award [1] for each distinct relevant point.*

multifunction cards allocate memory into independent sections of the card;  
the card has a microprocessor that manages the memory;  
data is kept in an organized file structure;  
organizations can maintain a diversity of products through the card;  
organizations can programme cards for individual use;  
to allow differential access to different age groups or levels of staff;  
hotel key can be programmed for the duration of the stay;  
cards can be updated rather than being replaced;  
this makes it cheaper and more convenient for the user;  
the same card can be used for different functions;  
so the user only has to carry one card;  
this can enhance security;  
a debit card for use in an university can enable a student to do multiple functions,  
*e.g.* photocopying, borrowing books from a library, getting access to buildings and  
borrowing money;

**[9 max]**

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