

MARKSCHEME

November 2003

DESIGN TECHNOLOGY

Higher Level

Paper 3

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) *[1]* for each of any **two** organoleptic properties from the following.

flavour;
smell;
appearance;
texture;
sound;

[2 max]

(b) *[1]* per distinct point.

“adult” and “child” are particular market segments;
flavours tend to be more sophisticated for “adult” market, e.g. cheese and chives versus plain cheese flavour, paprika flavour;
texture of crisps / snack products may vary according to target market;
appearance, e.g. shapes of pieces, may be important for “child” market and may involve novelty shapes, e.g. dinosaurs or space craft;

[3 max]

D2. *[1]* per distinct point.

oxidation of double bonds present in unsaturated fatty acids found in triglycerides;
result in formation of compounds (aldehydes and ketones) which give the fat off/tallowy flavours;

[2 max]

D3. *[1]* per distinct point in brief explanation.

health consciousness relates to issues of low fat, low sugar, low cholesterol, high fibre;
new food products can be designed to achieve particular goals, e.g. “lite” products are low in fat or low in sugar;

[2 max]

D4. *[1]* per distinct correct point.

raw, unprocessed fruits and vegetables are low in cost;
but processing them into chips means that they can be sold for a much higher cost;
if processed on-farm this additional money goes to the farmer and thus farm sustainability is enhanced;

[2 max]

D5. [1] per distinct point up to [3 max] under each of three headings [total 9 max].

Problems associated with synthetic fertilizers and pesticides

[3 max]

Degradation of soil quality;
Pollution of soil / Pollution of water / Pollution of food;
Health effects on farmers/farm workers/rural communities;
Resistance of pests to pesticides;
High costs reduce profitability;

How can organic agriculture be considered as an alternative technology

[3 max]

Organic agriculture eliminates the use of synthetic fertilizers and pesticides;
thus it can be considered as a viable alternative to existing mainstream agricultural technologies;
New higher yielding plant varieties can be bred to overcome not using fertilizers;
Biodiversity is used (in integrated pest management) for pest control;

Organic agriculture's contribution to sustainable development

[3 max]

Organic agriculture reduces the financial burden of buying synthetic fertilizers and pesticides; thus it increases profitability;
Enhanced food security in local communities;
There is increasing market pull for organic products;
Organic products can command prestige prices;
Reduces damage to humans;
Reduces reliance, especially of developing world, on exploitative relationships with developed countries (generally the synthetic fertilizer and pesticide manufacturers);

Option E – Computer aided design and manufacturing

- E1.** (a) *[1] per distinct point.*
two axes perpendicular to each other are available – X and Z / R and Z;
the axes reflect the movement of the tools that results in shaping of the
lathed pieces; *[2 max]*
- (b) *[1] for problem and [1] for brief explanation.*
wood is a natural composite, and inherently non-uniform;
the grain varies which makes it problematic;
the wood has to be made cylindrical before it can be lathed;
so this involves considerable preparation work;
the wood chips / slivers clog up the machine;
and it has to be cleared at frequent intervals;
the machine needs to be regularly oiled;
else its life span is shortened; *[2 max]*
- (c) *[1] per distinct relevant point within explanation.*
graphics produced using the computer running with appropriate software;
the computer instructs the CNC lathe how to manufacture the design seen
on the screen;
computer + software + lathe = CAD/CAM; *[3 max]*
- E2.** *[1] per distinct point.*
a digital camera is an example of an input device;
which can be used to input images into a CAD system for manipulation with
the software; *[2 max]*
- E3.** *[1] per distinct point.*
CAD/CAM provides a way to manufacture components very accurately;
increased accuracy results in higher quality volume production; *[2 max]*
- E4.** *[1] for each distinct correct point [9 max]*
Cost of labour may be reduced;
the logistics of global distribution are facilitated;
i.e. raw materials are not transported across the world for manufacture and then back again
for distribution;
manufacturers can more easily meet different legislative requirements;
manufacturers can customize products for local markets;

governments often charge a tariff for importing goods;
if a manufacturer produces goods in a country then the tariff would be avoided;

governments often pay manufacturers money to establish factories in a country;
global manufactures can benefit from incentives and become more profitable;
manufacturers can benefit from differential exchange rates; *[9 max]*

Option F – Invention, innovation and design

- F1.** (a) *[1]* for identifying a safety issue and *[1]* for a brief explanation.
the user can come in contact with electrical element;
so there is the potential for electric shock;
the user can come in contact with hot parts;
so could be easily burnt as they insert and remove toast from the machine; *[2 max]*
- (b) *[1]* for identifying an appropriate technological advance that has enabled the reinnovation of the toaster and *[1]* per distinct point for an explanation.

advances in materials, e.g. advances in the nature of plastics;
has enabled enhanced range of colours;
and enhanced recycling potential;

advances in manufacturing processes, e.g. CAD/CAM;
has enhanced range of shapes, surface detail possible;
and enhanced design possibilities; *[3 max]*
- F2.** *[1]* per distinct point.
one aspect of the ongoing design of the toaster has been to enhance the energy efficiency of the toaster;
and to make it toast more evenly with less user intervention;
fashion has played a major role in design of the toaster;
e.g. in making toasters to match kitchen styles/colours/other appliances, e.g. kettle, saucepans; *[2 max]*
- F3.** *[1]* per distinct point.
a new concept coming onto the market does not have any competition;
and therefore the corporation adopting a pioneering strategy can “clean up” i.e. command a high price which the market will pay due to little or no competition, potential for big profits before the competition gets on the market;
however, this strategy is high risk if the market is not ready at the current time or price; *[2 max]*
- F4.** *[1]* for reason and *[1]* for brief explanation.
products are becoming increasingly complex and rely on expertise from various disciplines;
which is facilitated by teams of inventor / designers;
the amount of investment required is often large;
and beyond the resources of one individual; *[2 max]*

F5. *[1] per distinct point.*

global shopping via the Internet allows consumers access to an ever-widening range of products from all over the world;
the Internet has created a global marketplace;
products are now very competitively priced;
there is increased choice;
there is more information available on products *e.g.* environmental information, buyers guides, feedback from satisfied/dissatisfied customers;
products can be accessed at any time of the day or night – 24/7 shopping;
it can be difficult to return faulty goods purchased on the Internet;
the consumer does not have direct dialogue with sales staff;
thus can avoid the “hard sell”;
there can be considerable gaps between ordering and delivery;

[9 max]

Option G – Health by design

- G1.** (a) *[1] per distinct relevant point for brief explanation.*
in vitro and *in vivo* tests first on animals and then on humans;
for a range of adverse reactions;
(specifically cytotoxicity, haemolysis, irritation, sensitisation, intracutaneous reaction,
systemic toxicity, implantations, genotoxicity, sub-chronic toxicity, carcinogenicity,
reproduction toxicity, names not required); *[2 max]*
- (b) *[1] per distinct relevant point in explanation.*
Pro Osteon can be shaped to fill bone defects of varying shapes;
the pore structure of Pro Osteon is very similar to human bone;
and provides a matrix through which blood vessels and new bone tissue can grow;
thus, the implant acts as a temporary trellis; *[3 max]*
- G2.** *[1] for naming each appropriate material.*
polyester;
nylon;
paraffined silver tubes; *[2 max]*
- G3.** *[2] for appropriate outline.*
if the person wears glasses;
behind-the-ear aids would be unsuitable;
if the person has difficulty handling small objects, *e.g.* due to arthritis;
a behind-the-ear aid would be most suitable;
in-the-canal and in-the-ear users will find using the phone difficult due to feedback;
whereas a completely-in-canal aid can be used with a phone; *[2 max]*
- G4.** *[2] for appropriate outline.*
a catalytic converter is a device that uses a catalyst to convert three harmful compounds in
car exhaust into harmless compounds;
the three compounds are: hydrocarbons (which produce smog due to the unburned fuel);
which are converted into carbon dioxide and water;
carbon monoxide (which poisons aerobic respiration and is formed by the combustion of fuel);
which is converted into carbon dioxide;
and nitrogen oxides (which lead to smog and rain and are created when the heat in the
engine forces nitrogen in the air to combine with oxygen);
which is converted back into nitrogen and oxygen; *[2 max]*

G5. [1 max] for each distinct relevant point.

vector-borne diseases such as malaria which is carried by mosquitos cause enormous problems throughout the developing world;

pharmaceutical companies do not make a priority of developing vaccines against these diseases; probably because they cannot make a massive profit on them as they can on other medications!;

in order to control the vectors a range of issues need to be addressed;

removing a place to harbour the insect vectors can control disease;

e.g. replacement of palm-thatched roofs with tiles removes the home for the insect vectors;

other benefits, *e.g.* reduction of indoor air pollution can also be achieved;

preventing the female insects from laying their eggs is another way of controlling disease;

e.g. septic tanks and latrine pits can be made mosquito proof by preventing female mosquitos from laying their eggs;

through the use of low cost solution such as the use of polystyrene beads;

[9 max]

Option H – Electronic products

- H1.** (a) *[1] per distinct relevant point.*
accepts input value from sensors, in this case (s1 – s8) which are fuzzified;
rules are evaluated from the fuzzified input to output computed truth values;
defuzzification steps translates truth values into crisp output; *[3 max]*
- (b) *[1] for identifying an appropriate benefit, [1] for brief explanation.*
maximise traffic flow;
so that drivers will be kept waiting for the minimum time; *[2 max]*
- H2.** *[1] for identifying the importance and [1] for brief explanation.*
feedback provides the inputs for fuzzification;
thus the traffic lights will change according to the prevailing traffic conditions; *[2 max]*
- H3.** *[1] for identifying an appropriate sensor and [1] for brief description.*
any non-contact sensor; *[1]*
could count cars as they pass the sensor; *[1]* *[2 max]*
- Or
- pressure sensors in road *[1]*
could similarly count cars as they pass *[1]*
- H4.** *[1] for each distinct relevant point.*
doping of semiconductor materials, *e.g.* silicon, can be used to create n-type semiconductors;
by the addition of elements (*e.g.* As, P, Sb) with five valence electrons;
and p-type semiconductors by the addition of elements with three valence electrons (*e.g.* B, Al, In and Ga);
which control the flow of current through the semiconductor material;
connecting p-type and n-type semiconductors to form a junction controls the flow of electronic current through the semiconductor material;
thus the dopant changes the conductivity of the material; *[2 max]*

H5. [1] for each distinct relevant point up to [4] for implications for users and up to [4] for implications for the traditional music industry, [1] for balancing statement.

Implications for the user:

access to world music;
no need to wait for music to be imported;
high quality (near CD) reproduction;
Internet sites allow access to global music library;
users can create their own compilations to listen at their own convenience;

Implications for the traditional music industry:

economics of the traditional music industry are based on artists giving up the copyright on their music to record companies who record, distribute and market their music. Fans then pay exorbitant sums to buy records;
MP3 challenges the notion of copyright;
MP3 allows high quality reproduction;
MP3 can allow many people to listen to and become fans of an artist;
MP3 allows illegal distribution and copying of the artists' songs, resulting in a substantial loss of money for the artist;
there is no secure delivery system / standard to allow record companies to get paid for Internet downloads and limit how those songs are used. Record companies don't want to encourage unsecured music on the Internet;
MP3 can allow things to get distributed that would not otherwise get released – in the process of recording lots of odds and ends are produced that may be of interest to fans but aren't necessarily something for an official release;

Balancing statement:

for small, unsigned bands, MP3 can be a efficient way of distributing music to new listeners and building an audience before being signed by a record company;

[9 max]
