

MARKSCHEME

November 2002

DESIGN TECHNOLOGY

Higher Level

Paper 3

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 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.

Option D – Food technology

- D1.** (a) it also kills food spoilage organisms; [1 max]
- (b) continuous processing;
could be used as an alternative so that the milk could effectively be poured continually along a pipe; [2 max]
- (c) energy considerations – if higher temperatures were used it would require more energy; it is easier to maintain 63 °C for 30 minutes accurately than it is to maintain higher temperatures for a very short time;
could not raise temperature to 72 °C and keep it there for 15 seconds due to rate of heat transfer; [3 max]
- D2.** [1] for an appropriate organoleptic property and [1] for identifying an appropriate market for which this property is modified – [2 max].
texture [1] e.g. baby foods are prepared by homogenizing them to overcome the baby's lack of teeth [1];
taste [1] – sophisticated spicy flavours e.g. paprika designed for an adult market [1]; [2 max]
- D3.** (a) [1] for appropriate definition.
the use of a shortening agent, e.g. fat, to prevent the extension of the gluten network in products containing flour; [1 max]
- (b) shortening prevents the dough forming an extended gluten network;
and thus the biscuit has a crumbly, brittle texture; [2 max]
- D4.** [1] for each distinct correct point on lines of argument below.
genetically modified products are highly controversial;
as a result governments react to the issue in different ways;
some allow genetic modification others not;
legislation surrounding genetically modified products differs between countries;
in some countries genetically modified products may not be allowed on market;
in countries where genetically modified products are allowed the products generally have to be clearly marked;
thus there may need to be customization of products and labelling to make it suitable for different countries;
for some markets it may be possible to use an appropriate language-free icon to indicate that the product is genetically modified;
it may be important for the GM-free nature of the food to be independently accredited and for this to be displayed on the packaging;
confirming the GM-free nature of food products is fairly sophisticated and some disreputable food manufacturers may risk not labelling their products appropriately; [9 max]

Option E – Computer aided design and manufacturing

- E1.** (a) a finite set of points (vertices) together with the edges connecting pairs of these points.
an edge can be a straight line or any other well defined space curve; [1 max]
- (b) wire frame modelling shows how the inside of the components are designed;
so helps the manufacturer to work out how to produce the component; [2 max]
- (c) first solid modelling and then wire frame modelling;
solid modelling is used to develop the concept and enables communication with consumers by showing surface features. Solid modelling relates to CAD;
wire frame modelling is used in the shift from design to manufacture. Wire frame modelling relates to CAD/CAM; [3 max]
- E2.** [1] for each distinct point.
established legacy (old) equipment still in use and working reliably;
so introduction of newer (more expensive) technologies not yet appropriate;
OR environmental considerations and mechanical processes involved;
mean that a mechanical solution may be cheaper and more reliable than an electronic one; [2 max]
- E3.** (a) [1] for appropriate definition.
a situation where a company keeps a small stock of components (or complete items) or items that take a long time to make just in case of a rush order; [1]
- (b) if there is a rush order (demand = high) the manufacturer is in a better position to respond;
if there are few or no orders (demand = low) then the manufacturer can replete stocks of components or items that can take a long time to make; [2 max]
- E4.** [1] for each distinct advantage up to [4 max].
it is easy to keep the systems updated;
call centre operatives can be trained through use of the expert system;
enables consistent support globally;
enables 24-hour support to be offered more cost-effectively;
[1] for each disadvantage up to [4 max].
the system may need to be updated very frequently to ensure its currency;
there may be slightly different variations in products produced in different parts of the world;
call centres rely on consumers being able to express the problem in a way that is meaningful to the call centre operatives;
the expert system needs to be available in a number of different languages;
[1] for balancing statement. [9 max]

Option F – Invention, innovation and design

- F1.** (a) *[1] for each distinct appropriate point.*
 family/group living scenario rather than one person living alone;
 working from home rather than rushing out to work – benefits then of continuous
 space heating;
 cooking “real” food not convenience foods (which might be better suited to Oven B);
 traditional values – oven A projects a more traditional image; *[2 max]*
- (b) *[1] for each distinct appropriate point.*
 opportunity to ensure that the product meets the latest safety standards;
 new technologies can be incorporated in the product;
 energy consumption generally enhanced in new models of product; *[2 max]*
- (c) *[1] for reason, [1] for brief explanation.*
 mixed fuel adaptation;
 means maintaining function easier;
 status product;
 therefore continuing demand;
 still satisfies customer;
 therefore market still serves function;
 appropriate;
 therefore not become obsolete;
 dual use;
 space heating and cooking; *[2 max]*
- F2.** *[1] for each distinct appropriate point.*
 the bicycle was first developed as a leisure/fun product;
 the bicycle was not initially seen as a serious form of transport;
 there were few cars;
 early bikes were experimental with designers trying different sizes of wheels, *etc.*;
 there was no cycle industry with a set of safety standards;
 no culture of litigation at that time (could not be sued);
 early bikes were very inefficient so not fast nor dangerous; *[2 max]*
- F3.** *[1] for each distinct appropriate point.*
 having established a market for a product, the product can be redesigned to be better (more features,
 smaller, lighter, more energy efficient, cheaper *etc.*);
 technological innovation spurs product innovation – technology push;
 market forces require reinnovation – market pull; *[3 max]*

- F4.** *[1] for each distinct correct point plus [2] for appropriate explanation up to [3 max] for each of three barriers.*

Culture;

the product needs to be consistent with the values of the culture of its proposed market;
if it is not appropriate then it will not be adopted;

Technophobia;

consumers fall into various categories in relation to their reaction to technological innovation;
technophobes always resist innovation;

Economics;

the cost of the innovation must be right for the innovation to be a success;
if it is too expensive then it may fail;

Environment;

to appeal to today's consumers the product should be able to demonstrate its environmental appropriateness;
green design is increasingly important;

Consumer demand;

no market, no profit;

[9 max]

Option G – Health by design

- G1.** (a) *Statement to the effect:*
protons interact with a strong magnetic field and radio waves to generate electrical pulses that may be processed like X-rays; [1 max]
- (b) no X-rays or other ionizing radiation with MRI;
unlike CT;
therefore hazards reduced;
OR Could do one CT scan on the embryo;
but could not do a series of scans to follow the development of the embryo;
because of the potential side effects; [2 max]
- (c) [1] for each distinct appropriate point and [2] for explanation.
cost versus need;
the need for different types of equipment can vary across the world;
depending on the underlying disease patterns;
OR use of MRI requires skilled staff thus there is a training requirement;
in addition to the capital expenditure; [3 max]
- G2.** (a) easily broken;
slow;
needs to be sterilized between patients which is problematic; [1 max]
- (b) [1] for each distinct appropriate point.
thermistors are resistors which change their resistance with temperature;
thermistors are generally non-linear in response thus careful calibration is necessary to get accurate results ;
thermistors are excellent for use in the continuous monitoring of a patient's temperature; [2 max]
- G3.** lenses can be made thinner;
thinner lenses are lighter;
lighter lenses are more comfortable to wear; [2 max]

G4. *[1] for each distinct correct point, [2] per factor for each of four factors.*

Reduce fuel consumption;

making the car more energy efficient in use will reduce air pollution through reducing the burning of fossil fuels;

Use more environmentally appropriate fuels;

use low sulfur fuels to reduce polluting emissions;

Enhance the effectiveness of end-of-pipe solutions, e.g. the catalytic converters

to reduce air pollution in the use of the motor car;

Use clean technologies that cause less air pollution to make the car;

energy used during manufacture is a major cause of air pollution;

Invest in the development of electric-powered vehicles with performance characteristics equivalent to petrol-fueled cars;

electricity has the potential to be generated by methods which minimize air pollution thus electric-powered cars can minimize air pollution;

[1] for balancing statement.

[9 max]
