



MARKSCHEME

May 2005

DESIGN TECHNOLOGY

Higher Level

Paper 2

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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 stating the range of doorframe heights that an 80-inch door would fit [1 max].*
- 79 ³/₄ - 80 ⁵/₈ inches; *[1 max]*
- (ii) *Award [1] for stating the appropriate number of hinges required to hang an 80-inch door [1 max].*
- 3; *[1 max]*
- (iii) *Award [1] for identifying the appropriate size hinge for a 36-inch wide door [1 max].*
- 4-inch; *[1 max]*
- (b) (i) *Award [1] for each of two advantages of using cardboard for the infill of the hollow door.*
- gives strength;
makes door rigid;
light; *[2 max]*
- (ii) *Award [1] for identifying correct values for calculation and [1] for correct answer including units, [2 max].*
- $36 - (2 \square \frac{1}{4}) - (2 \square 1 \frac{1}{2})$;
32 ¹/₂ inches; *[2 max]*
- (c) (i) *Award [1] for each of two appropriate advantages of using plywood for the cladding of the door from the list below [2 max].*
- can be varnished to give a natural timber effect;
cheaper than solid timber;
can be stained to an appropriate colour;
can be painted later for a “new” look;
will not warp; *[2 max]*
- (ii) *Award [1] for each distinct point in an appropriate explanation [3 max].*
- the door can be removed easily at a later date;
no screwdriver would be required;
if the door needs to be re-painted or varnished or removed to allow easier passage, e.g. for moving furniture into a room; *[3 max]*

(d) (i) *Award [1] for an answer to the effect of [1 max].*
 whether to use an oil-based or water-based stain; *[1 max]*

(ii) *Award [1] for each step in a calculation as show below [3 max].*
 water-based stain 1 coat 1.5 hours;
 matt finish 3 coats 3.5 hours per coat
 $(1 \times 1.5) + (3 \times 3.5) = 12$ hours; *[3 max]*

(e) (i) *Award [1] for stating an appropriate reason [1 max].*
 seal the door;
 enhance its water-resistance;
 stop dirt and grease getting ingrained into the surface; *[1 max]*

(ii) *Award [1] per distinct point:*
 $3.9 \text{ m}^2 \times 3 = 11.7 \text{ m}^2$;
 coverage = $10 \text{ m}^2 \text{ l}^{-1}$ therefore 1.2 litres would be required;
 one litre can and one 0.5 litre can **OR** 3 0.5 litre cans; *[3 max]*

2. (a) *Award [1] for a definition to the effect of [1 max].*
 the use of computers to aid the design process; *[1 max]*

(b) *Award [1] for each distinct appropriate point in an explanation [3 max].*
 models represent selected features of a design;
 each model will be used to develop different aspects of the design;
 models are used to communicate to a range of different audiences, e.g. consumers
 who may not be technically minded and other professionals, e.g. manufacturers; *[3 max]*

3. (a) *Award [1] for describing user research and [1] for showing how a user trial differs [2 max].*
 in user research data is collected from users using a questionnaire or other data
 collection tool;
 in a user trial data is collected by observing a user's behaviour; *[2 max]*

(b) *Award [1] for identifying a way in which planned obsolescence influences the
 product cycle and [1] for a brief explanation [2 max].*
 planned obsolescence has a definite timescale;
 a designer would develop the specification for a product with this timescale in
 mind; *[2 max]*

4. (a) *Award [1] for each of two distinct points in an explanation [1 max].*

high protein;
high fibre;
low cholesterol;
low fat;

[1 max]

- (b) *Award [1] per distinct point in an explanation of how mycoproteing can be designed into a range of novel food products [1 max].*

dough from fermentation is mixed with a binding agent;
flavouring and colouring agents are added;
the dough is put into a forming machine to give it the required shape;

[3 max]

5. (a) *Award [1] for each characteristic of glass from the list below [2 max].*

extremely brittle;
transparent;
high hardness;
unreactive;
aesthetic appeal;

[2 max]

- (b) *Award [1] per distinct point in a description of cotton [2 max].*

natural fibre;
obtained from bud of cotton plant;
grows in sub-tropical regions;
high absorbency;
low elasticity;
good conductor of heat;
chars rather than melts when subjected to high temperatures;

[2 max]

6. (a) *Award [1] for a definition to the effect of.*

resources that are naturally replenished in a short time (less than one human lifetime).

[1 max]

- (b) *Award [1] per distinct reason and [1] for each distinct point in an explanation [3 max].*

by minimizing waste;
by optimizing the efficiency of complete systems;
by maximizing the use of renewable energy sources;
by minimizing the use of non-renewable energy sources;

[3 max]

SECTION B

7. (a) (i) *Award [1] for a definition to the effect of the following [1 max].*
representation of ideas on paper without the use of technical aids **[1 max]**
- (ii) *Award [1] for each distinct point in a brief description [2 max].*
to explain the thinking behind the visual image;
to consider the implications of the ideas for further development; **[2 max]**
- (iii) *Award [1] for why concept cars exemplify radical design and [1] for why they exemplify incremental design [2 max].*
concept cars combine radical design elements, e.g. the body shape;
with standard/marginally modified design elements, e.g. tyres and engine; **[2 max]**
- (b) (i) *Award [1] for a reason why mild steel should be treated and [1] for a brief explanation [2 max].*
mild steel corrodes/rusts unless treated/finished;
treatment/finish prevents oxygen or water or both reaching the surface; **[2 max]**
- (ii) *Award [1] for each distinct point in a description of how plastic deformation is relevant to the shaping of the mild steel body parts [2 max].*
mild steel is subjected to stress higher than the yield stress results in plastic deformation;
once in the plastic region the mild steel will retain its new shape; **[2 max]**

- (c) (i) *Award [1] for each of two ways in which fashion influences the design of the concept car [2 max].*

body shape;
body colour;
accessories (e.g. in-car sound system);

[2 max]

- (ii) *Award [1] for distinct point each point [3 max] for the way that reuse, recycling and repair could be used modify the environmental impact of a concept car [9 max].*

Reuse

standard parts can be reused if car is scrapped;
standard parts do not have to be created specially for the concept car;
standard parts would be more easily distributed and reduce the material held in storage around globe;

Repair

ease of disassembly (e.g. screws not rivets);
detailed technical manual to support repairers;
modular design for ease of replacement;
standard parts are easier to obtain to promote repair;

Recycling

specification of economically recyclable materials;
clear labeling of parts in terms of the material they contain;
ease of disassembly promotes recycling so materials can be separated for recycling;

[9 max]

8. (a) (i) *Award [1] for a definition to the effect of the following [1 max].*

that proportion of the population with a dimension at or less than a given value

[1 max]

(ii) *Award [1] for each appropriate response from the list below [2 max].*

the poncho does not need to fit;
three sizes are likely to cover range without being massively oversized for any individual;

[2 max]

(iii) *Award [1] for each distinct point in an appropriate description of what would happen if a very large person were to attempt to wear a small size poncho [2 max].*

initially the material would be elastic as the coiled chains were stretched and if the stress were removed, *i.e.* the person took off the poncho, the material would return to its original size and shape;
however, if the stress exceeded the yield stress and the material went into the plastic region then the secondary bonds would weaken and the molecular chains would slide over each other and the material would not return to its original size and shape if the person were to take the poncho off;

[2 max]

(b) (i) *Award [1] for each appropriate disadvantage of cutting and machining the pieces for the poncho from the list below [2 max].*

the pieces have to be assembled into the finished garment;
material is wasted in the process;
stitching will give holes in the material;

[2 max]

(ii) *Award [1] for each appropriate advantage of heat fusing over stitching from the list below [2 max].*

heat fusing is likely to require fewer skills than stitching;
heat fusing results in a totally waterproof seam;
heat fusing means that only one material is used in the production of the garment therefore easier to recycle garment after use;
faster;
cheaper;

[2 max]

- (c) (i) *Award [1] for identifying an advantage of selecting a thermoplastic for the production of the ponchos and [1] for a brief explanation [2 max].*

cheap;
keeps price of poncho low;

waterproof;
therefore does not absorb water;

available in sheets;
thus garment parts can be cut from the sheet;

can be printed;
thus festival logo can be applied easily;

easily recyclable through application of heat;
therefore can be recycled cheaply and easily;

[2 max]

- (ii) *Award [1] for each distinct way and [1] for each distinct point of explanation [3 max] for each of three ways that the hooded poncho does not meet the characteristics consistent with sustainable development [9 max].*

disposable item;
designed for short-term characteristics not long-term ones;
wear once and throw away;

the poncho is low durability;
the poncho is not designed for repairability;
thus if it tears or stretched out of shape it will be disposed off;

putting the festival logo on the poncho makes it more collectable;
this will mean that it is likely to be kept and reused by its owner;
this is consistent with sustainable development;

poncho would not need to be disassembled for recycling;
thus it could be easily recycled;
this is consistent with sustainable development;

[9 max]

9. (a) (i) *Award [1] for a definition to the effect of the following [1 max].*

a composite material with the unique property of having almost zero resistance at very low temperatures *[1 max]*

(ii) *Award [1] for each distinct point in a brief explanation of the relevance of constructive discontent to the ongoing development of superconductors [2 max].*

until a superconducting material is able to operate at room temperature the cooling of superconductors is a major issue for energy utilization; constructive discontent would fuel the ongoing search for superconductors that are able to operate at room temperature; *[2 max]*

(iii) *Award [1] for an advantage of being able to produce superconducting materials that operate at room temperature and [1] for a brief explanation, [2 max].*

reduced energy consumption;
would reduce environmental impact of superconductors;
reduced requirement for cooling circuitry;
would make superconductors easier to implement; *[2 max]*

(b) (i) *Award [1] for each distinct point in a brief description of how one-off production contributes to the volume production of superconductors, [2 max].*

sintering requires the use of a mould;
the mould is an example of one-off production; *[2 max]*

(ii) *Award [1] for identifying one reason why economic considerations mean that sintered products are normally produced in volume and [1] for a brief explanation, [2 max].*

the mould is expensive to produce;
thus to offset the set-up costs a number of items need to be produced; *[2 max]*

- (c) (i) *Award [1] for each of two appropriate ways that sintering can be considered a clean technology from the list below [2 max].*

reduced waste;
less pollution;
more efficient use of materials;
no surface machining required;

[2 max]

- (ii) *Award [1] for each distinct point in an explanation [3 max] for each of three ways that levitating trains are consistent with sustainable development [9 max].*

levitating train would significantly reduce journey times;
this would be important in encouraging people to use the train, especially for long journeys;
offers a potentially more sustainable alternative to air transport for intermediate length journeys;

levitating train use large amounts of energy;
this is potentially polluting unless renewable energy, e.g. hydroelectric power is used;
this would not be consistent with sustainable development;

levitating train offers increased efficiency in the use of raw materials;
reduced resource utilization is consistent with sustainable development;
natural resources are finite and need to be conserved for future generations;

[9 max]
