

MARKSCHEME

November 2002

DESIGN TECHNOLOGY

Higher Level

Paper 2

Subject Details: Design Technology HL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in Section A (total 32 marks) **ONE** question in Section B [20 marks]. Maximum total = 52 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 B

Extended response questions - quality of construction

- Extended response questions for HL P2 carry a mark total of 20. Of these marks, 17 are awarded for content and 3 for the quality of construction of the answer.
- Three aspects are considered:
 - expression of relevant ideas with clarity
 - linking of ideas (relevant or irrelevant) in a logical sequence
 - for design using appropriate communication methods.
- The 3 quality marks are to be awarded according to the following criteria:

Clarity of argument:

1 mark Consistently expresses relevant ideas with clarity.

‘Designer’ logic:

1 mark Demonstrates planning; design contexts and relevant examples; prioritises issues

Communication:

1 mark Employs techniques; (graphs, flowcharts, algorithms, appropriate communication, diagrams, annotations of graphs, tables and charts, 2D / 3D sketches *etc.*)

- It is important to judge this on the overall answer, taking into account the answers to all parts of the question. Although, the part with the largest number of marks is likely to provide the most evidence.
- Candidates that score very highly on the content marks need not necessarily automatically gain the two points for the quality of construction (and vice versa).
- The important point is to be consistent in the awarding of the quality points. For **sample scripts for moderation** the reason why quality marks have been awarded should be stated.
- Indicate the award of quality marks by writing **Q3, Q2, Q1 or Q0** in **red** at the end of the answer.

SECTION A

1. (a) *Either reason suitably outlined by reference to both puppets.*

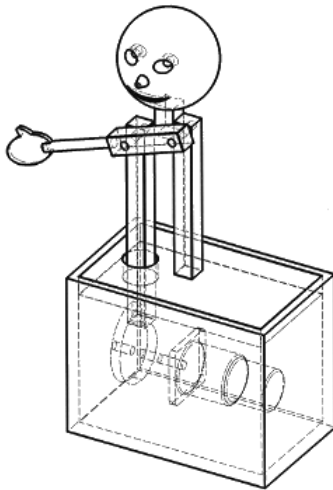
sizes of the pieces are smaller;
the push rod is longer than the leg;

[2 max]

- (b) plywood does not warp;
laminated so stronger;
plywood often veneered and so more attractive for a display box;
stability is required for the base;
other components are rod-like structure;
these are more easily cut and shaped from solid timber;

[4 max]

- (c) (i)



relationship cam - push rod;
relationship motor / gearbox - cam;
3D correct;
*do not penalise if only cam and
push rod shown.*

[3 max]

- (ii) $VR = 3:1$;
therefore if cam moves push rod 15 mm;
hand will move $15 \times 3:1 = 45$ mm;

[3 max]

- (d) (i) $VR = 4:1$ therefore if hand moves 20 mm wire has to shrink 5 mm;
nitinol wire contracts 5 % therefore to give 5 mm contraction / 100 mm of wire
is needed;

[1] only for 100mm without explanation / calculation showing.

[2 max]

- (ii) the output of the box ultimately switches on and off;
the control box switches on the current for 0.25 secs and off for 0.25 secs;
therefore allowing the wire to contract and return to 100 mm (normal);
therefore commencing the cycle with the effect being to oscillate the hand;

[4 max]

2. taste *[1]* should taste like the meat product *[1]*;
smell *[1]* should smell like the meat product *[1]*;
colour *[1]* should have the same colour as the meat product *[1]*;
shape *[1]* should have the same shape as the product *[1]*;
texture *[1]* should have similar texture to the meat product *[1]*; *[4 max]*
3. no treatment or finish required after sintering;
sintering is suitable for small, delicate components;
sintering produces precision components;
sintering fuses together the different materials forming the ceramic alloy;
sintering is good for volume production; *[3 max]*
4. *[1]* for identifying a suitable feature of the control system; *[1]* for describing how it works; *[1]* for relating to an example.
use of sensors to monitor quality of manufacture;
feedback – closed loop system to report and problems;
feedback means large quantities of poor products not manufactured before the fault is realised; *[3 max]*
5. (a) mechanisation – human control;
automation – electronic or computer control; *[2 max]*
- (b) less work is required;
different skills required; *[2 max]*

SECTION B

6. (a) *Any one reason suitably outlined, [2 max]. [1] for only making a statement e.g. hygienic.*
easy to keep clean;
hygienic – unreactive with chemicals;
durable – resistant to rough treatment;
corrosion resistant – will not rust when exposed to moisture;
can be heat sterilised;
non porous material;
- (b) (i) one that possesses a short enough (one human lifetime) time for natural processes to replenish it; [1]
(ii) paper or board; [1]
- (c) *Any two reasons, [2] each. [1] for a statement not outlined in relation to the weight of the can.*
the need to conserve resources;
the need for lighter products to carry and transport
improved manufacturing technology giving greater precision;
more R&D into finishes / materials leading to less corrosion;
improved design of the can to use less materials; [4 max]
- (d) *Any four reasons suitably discussed referring to paper and board and plastics, [2] each. [1] for referring to the proportions in the pie chart.*
paper and board are more traditional packaging material;
manufacturing technology not so advanced for paper and board as for plastics;
less capital investment required for manufacturing with paper and board than with plastics;
easier to print on paper and board compared to plastics;
paper and board easier to recycle than plastics; [9 max]

Expression of ideas max [3 marks]

Total [20 marks]

7. (a) *Any two of the following.*
non-toxic;
transparent;
easily shaped;
resistant to scratching;
aesthetic properties; **[2 max]**
- (b) *Any four of the following.*
very low thermal expansivity;
very high hardness;
very low thermal conductivity;
very low solubility in;
very low solubility in organic solvents; **[4 max]**
- (c) *Any one reason [2].*
rubber is a non slip material making the protector stable on the work surface;
make it easier to pick up by raising it off the work surface;
further reduce conduction of heat to work surface; **[2 max]**
- (d) *Four factors suitable discussed, [2] each. [1] for a balanced discussion between product testing and market research.*
user trials – ask typical users to use prototypes and evaluate them;
expert appraisal - use prototypes and evaluate them (experts in kitchen equipment);
use different shapes and patterns for tests;
evaluate existing products in the marketplace;
laboratory tests / trials to consider ease of manufacture;
energy / materials considerations / ergonomics;
performance tests to test for ease-of-use / safety;
market research to evaluate the market conditions;
market research re: need;
literature research - conductivity of materials; **[9 max]**

Expression of ideas max [3 marks]

Total [20 marks]

8. (a) (i) *Any two of the following.*
very tough;
very strong;
resistance to moisture;
low density; **[2 max]**
- (ii) a traditional material may be appropriate in terms of one property and deficient in terms of another. A second material may be deficient in terms of the first and fine in relation to the second;
combining the two materials into a new material allows the properties of the composite to meet the specification; **[2 max]**
- (b) carbon fibre is not suitable for injection moulding;
the nylon-carbon fibre composite can be injection moulded; **[2 max]**
- (c) wood and/or metal are natural material resources;
CPR is a composite material made from synthetic materials and so does not use natural material resources; **[2 max]**
- (d) **[1]** for each aspect up to **[8 max]** and **[1]** for a good balance.
Youngs modulus concerns the strength and stiffness of the structure;
the tennis racket needs to be strong enough to resist the loading created by the impact of the tennis ball;
the tennis racket needs to be stiff enough to be rigid in the use but have enough elasticity to absorb the impact of the ball;

structures need to have a balance of tensile and compressive forces;
the strings of the racket are in tension;
and the frame in compression;

Any three: shape refers to ease-of-use i.e. ergonomics; weight i.e. hollow; strength; ease-of-manufacture; **[9 max]**

Expression of ideas max [3 marks]

Total [20 marks]
