

MARKSCHEME

May 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

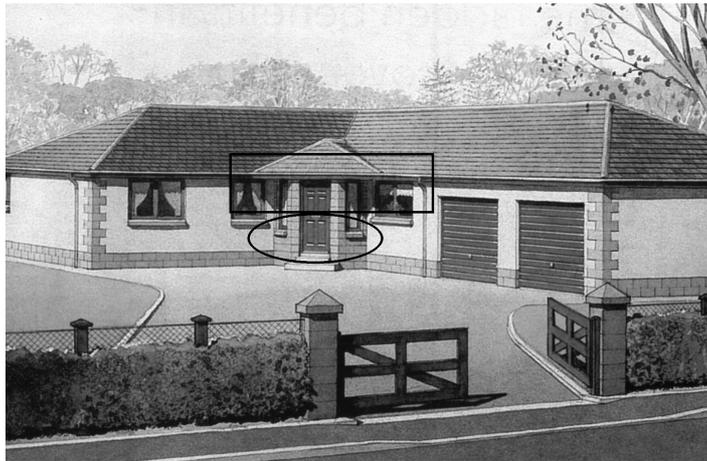
1. (a) (i) exterior; [1]
(ii) PIR55; [1]
(iii) 12 V – 14 V or 12 – 14 V; [1]

(b) (i) Award [1] for calculation and [1] for correctly deduced data.

$$\frac{3.142 \times r^2}{(360 \div 30)} \quad \frac{3.142 \times 144}{12} = 37.7 \text{ m}^2$$

Deduct [1] if units omitted. [2]

- (ii) PIR55; [1]
(iii) PIR40; [1]



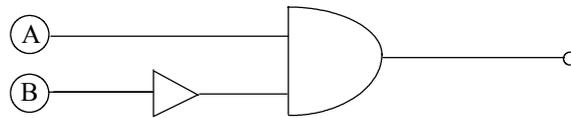
- (iv) Sensor A anywhere on the Rectangle shown; [2 max]
Sensor B anywhere on the Ellipse shown;

(c) (i) Award [1] for a correctly completed truth table.

Sensor A (Human)	Sensor B (Cat)	Solenoid
0	0	0
1	0	0
0	1	1
1	1	0

[1]

(ii)



for AND gate [1];
for NOT gate [1];
for correct wiring [1];

[3 max]

(d) (i) Award [1] for each correct answer from the list.

transparent to Infra Red;
protect the sensors from damage (physical, chemical or damp conditions);
moldable;
low maintenance;
low degrading;

[2 max]

(ii) thermosets have been primary bonds forming strong crosslinks between adjacent polymer chains;
giving them a rigid three dimensional structure;

[2 max]

(iii) Award [1] for stating that heat and pressure used to create thermosets cannot be reversed and award [1] for stating that thermosets cannot be recycled.

[2 max]

2. (a) *Award [1] for each correct answer from the list.*
must reduce moisture content;
non seasoned timber will be susceptible to wet rot, insect attack, fungal attack;
internal stress will crack the wood if used in structures in an unseasoned state;
rate of drying must be controlled to prevent cracks (shakes); *[3 max]*
- (b) *Award [1] for each correct answer from the list.*
high melting points of raw materials;
strong chemical bonds involved;
high thermal capacity of materials used and finished product; *[2 max]*
- (c) *Award [1] for each correct answer from the list.*
scrap glass lowers the melting point of the glass;
lower energy cost means cheaper production;
reduced energy requirements leads to faster production; *[2 max]*
3. (a) Definition as p157 guide; *[1]*
- (b) *Award [1] for definition of:*
composite as p159 and a further [1] for stating that a composite can be made up of
dissimilar materials with complementary properties whilst an alloy is made of a
mixture of the same materials namely metals. *[2 max]*
4. (a) Definition as p160 in guide; *[1]*
- (b) *Award [1] for each correct answer from the list.*
making wire;
making tubing;
making spun sugar ductile when hot;
making glass fibre ductile when hot; *[2 max]*

SECTION B

5. (a) (i) *Award [1] for each correct answer from the list.*
heat resistant;
direct light;
hold lamp;
fix to frame;
insulating (heat and electricity);
moldable;
aesthetically pleasing; *[2 max]*
- (ii) *Award [1] for each correct answer from the list.*
spun aluminium (malleable metal);
heat resistant plastic;
thermoset;
sheet steel;
glass; *[2 max]*
- (b) (i) *Award [1] for $MA = 0.4$;*
Award [1] for % efficiency 40 %;
Award [1] for correct calculations including units; *[3 max]*
- (ii) *Award [1] for each correct answer from the list.*
losses in the system;
friction;
closer to a structure than a mechanism; *[2 max]*
- (c) *Award up to [2] for each criteria described and justified.*
1. quality of light – must be in the correct place, little glare, no over spill;
2. ease of adjustment – range, balance, stability, stay put;
3. cost of manufacture – materials, manufacturing method and scale;
4. aesthetics – finish, form, user satisfaction rating; *[8 max]*

6. (a) (i) *Award [1] for each correct point made from the list.*
the factor of safety must take into account:
the uniformity of the material;
the type of loading-static or dynamic;
the effect of the failure;
the effect of wear or corrosion on the material; *[2 max]*
- (ii) correct transposition of the formula;
1160 tonnes; *[2 max]*
- (b) (i) *Award [1] for each correct answer from the list.*
capable of being 'taught' the task;
flexible – able to do more than one task within limits;
operate independently of human intervention;
contribute to an automated production system; *[3 max]*
- (ii) *Award [1] for each correct answer from the list.*
tireless – can operate without rest periods;
does not need support facilities – heat, light, food, sleep *etc.*;
accepts minimum space allocation;
very accurate – does not make mistakes; *[2 max]*
- (c) *Award [1] for each correct element from the list within a reasoned statement [6 max].*
must carry the maximum load specified;
must move vertically and horizontally concurrently;
must know where it is;
must be able to locate any cell accurately;
must be able to place and retrieve from any cell to a pick-up/discharge point;
must 'know of' empty cells and use them without intervention;
- Award [1] for identifying the need for:- [2 max]*
sensors – to detect position *etc.*;
motors and other drive systems – to move to the correct location;
safety devices – overload and foreign body detection; *[8 max]*

7. (a) (i) a synopsis of the definition of reserve and resource on p167 Guide;
stating that a reserve is that part of a resource available for use with available technology; **[2 max]**
- (ii) *Award [1] for each correct answer from the list.*
tidal;
solar;
wind;
hydro;
bio-mass; **[2 max]**
- (b) (i) *Award [1] for each correct element in the statement from the list.*
observation of user behaviour;
collection of data;
user trips;
brainstorming;
user responses;
information searches (see 1.2.4); **[3 max]**
- (ii) *Award [1] for each correct answer from the list.*
symbolic model of reserves/resources;
physical models of stoves of all types;
symbolic model of stoves efficiency, material use, strength *etc.*; **[2 max]**

- (c) stating that an evaluation process was involved;
Award [1] for each correct answer from the list for each stove. [3 max × 2]

Solar

efficiency: speed of cooking *etc.*;
can it cook the foods required?;
is it easy to use?;
physically strong;
can the villagers use it with minimum training?;
are special cooking pots needed?;
is it acceptable to the intended users?;
can it be made locally and cheaply?;

Solid fuel

efficiency - less fuel for a given task in less time than the open fire;
can it use the range of fuels expected?;
is it physically strong enough?;
can it be made locally and cheaply?;
can the villagers use it with minimum training?;
is special cooking equipment needed?;
is it acceptable to the users;

Award [1] for suggesting one of the following:-

user trials;
objective testing to measure efficiency;
subjective comments from the users;

[8 max]
