



# **MARKSCHEME**

**November 2007**

**DESIGN TECHNOLOGY**

**Higher Level**

**Paper 2**

*This markscheme is **confidential** and for the exclusive use of examiners in this examination session.*

*It is the property of the International Baccalaureate and must **not** be reproduced or distributed to any other person without the authorization of IBCA.*

If you do not have a copy of the current Design Technology Guide,  
please request one from IBCA.

## 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.
- Words that are underlined are essential for 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 the calculation and [1] for the correct answer.*  
cost of project is \$30 billion US, 1/3 of project cost is for resettling people  
therefore 30 billion/3;  
answer = \$10 billion US (answer needs US and \$); *[2 max]*
- (ii) *Award [1] for the correct information and [1] for calculation and [1] for the correct of answer.*  
\$1.7 million per 400 metres;  
= \$1.7 million/4 = \$0.425 million per 100 metres;  
= \$0.425 x 17 = \$7.225 million; *[3 max]*
- (b) (i) *Award [1] for identifying the information from the data and [1] for correct answer.*  
reservoir is 161 metres deep, height of dam wall is 185 metres;  
185-161 = 24 metres (units required); *[2 max]*
- (ii) *Award [1] for identifying reason and up to [2] further marks for explanation along the lines of:*  
factor of safety required to withstand greater forces than maximum predicted force;  
if dam failed then effect would be devastating;  
therefore a high factor of safety is required; *[3 max]*
- (c) (i) *Award [1] for one advantage and [1] for one disadvantage.*  
advantage:  
reduce pollution (no coal needs to be burnt);  
hydro-electric power is a renewable resource;
- disadvantage:  
loss of timber;  
loss of arable land; *[2 max]*
- (ii) *Award [1] for each correct statement [2 max].*  
large area of water therefore possible to generate a great deal of electricity;  
efficient system;  
after capital outlay, electricity is cheap; *[2 max]*
- (d) *Award [1] for interpreting graph and [1] for correct answer.*  
growth rate is 0.1 billion tonnes per year;  
estimation is 2.2 billion tonnes by 2012; *[2 max]*

- (e) (i) *Award [1] for something along the lines of:*  
Hubei Province will get 15 % and Sichuan Province will get 5 % so Hubei will get a 10 % increase over Sichuan; **[1 max]**
- (ii) *Award [1] for correct data identification [1] for the calculation and [1] for the answer.*  
three gorges dam replaces 32 million tones per year;  
in 2002, 150 million tones of coal was used for whole of China;  
therefore number of dams =  $150\,000\,000 / 32\,000\,000$ ;  
answer = 4.687 dams (obviously can't have 0.687 of a dam) so answer = 5; **[3 max]**

2. (a) *Award [1] for the correct definition.*  
a measure of how fast heat is conducted through a slab of material with a given temperature difference across the slab; *[1 max]*
- (b) *Award [1] for each distinct point in a suitable discussion along the lines of:*  
metal is a good conductor of heat;  
a kettle must conduct heat to the water inside;  
the heat from the hotplate is efficiently transmitted to the water being heated without damaging the kettle;  
the kettle is efficient in doing its job without losing temperature to the surroundings;  
the kettle gets hot and user needs to pick up safely; *[3 max]*
3. (a) *Award [1] for*  
extrusion; *[1 max]*
- (b) *Award [1] for each point in a suitable explanation along the lines of*  
nylon requires little surface finishing;  
as the desired characteristics can be designed into it no extra treatments required;  
it's a fully automated process, so cost effective; *[3 max]*
4. (a) *Award [1] for each of any two materials from the list below.*  
limestone;  
sand/silica;  
sodium carbonate;  
silicon dioxide;  
sodium oxide;  
calcium oxide; *[2 max]*
- (b) *Award [2] for*  
toughened glass shatters when broken;  
laminated glass cracks but does not shatter; *[2 max]*

5. (a) *Award [1] each for two appropriate points.*  
in brainstorming participants use the ideas of others to spark off their own ideas;  
participants build upon ideas to produce new ones;  
no criticism is allowed;  
even the most ridiculous ideas are acceptable;  
volume of ideas is important; *[2 max]*
- (b) *Award [1] for each of two points in a comparison.*  
*(Do not award marks unless a comparison is made)*  
convergent thinking is the ability to use information in order to select an answer  
from alternatives;  
is solution focused;  
while divergent thinking uses creative ability to produce a wide range of possible  
solutions to a problem;  
is problem focused; *[2 max]*
6. (a) *Award [1] for the definition.*  
a technology that is appropriate to the context in which it is applied; *[1 max]*
- (b) *Award [1] for each characteristic in a list.*  
local resources;  
low pollution;  
recyclability;  
renewability;  
low energy use;  
local labour;  
no depletion of resources;  
low capital costs;  
use local materials;  
create jobs;  
renewable energy;  
not detrimental to the quality of life;  
understandable technology; *[3 max]*

**SECTION B**

7. (a) (i) *Award [1] each for*  
chrome (Cr);  
nickel (Ni); *[2 max]*
- (ii) *Award [2] for describing one characteristic*  
  
good corrosion resistance;  
does not easily oxidize (rust);  
  
very hard;  
does not scratch easily;  
  
good tensile strength;  
does not break easily;  
  
can be easily sharpened;  
will stay sharp for a long time;  
  
good surface finish;  
requires no protective coating; *[2 max]*
- (b) (i) *Award [2] for*  
the higher the Young's Modulus the stiffer the product;  
a steel knife needs to be stiff; *[2 max]*
- (ii) *Award [3] for a comparison along the lines of:*  
plastic is less stiff than stainless steel;  
under loading, a plastic knife deflects more than stainless steel;  
and is therefore more prone to fracture so it is less effective than stainless  
steel;  
plastic has less deflection before breaking; *[3 max]*
- (c) (i) *Award [2] for*  
linear chain molecules;  
with weak secondary bonding between the chains; *[2 max]*



- (ii) Award **[1]** for each consideration of plastic in relation to each of the three areas, **[3 max]** per area.

aesthetic:

- available in a range of colours;
- does not feel solid/durable;
- looks cheap;
- surface finish becomes dull with use;
- can be moulded into shape;
- smooth or textured can be designed into the mould;

ease of manufacture:

- easy to volume produce;
- expensive mould production;
- cheap to manufacture in volume;
- very little labour involved;

environmental considerations:

- suitable for recycling;
- planned obsolescence;
- disposable, so much waste;
- causes pollution if not recycled;
- uses up material resources;

**[9 max]**

8. (a) (i) *Award [1] for each distinct point in an appropriate outline.*  
ability to form complex shapes;  
build strength into shapes;  
cost effective solution;  
suitable for a thermoplastic;  
rapid assembly;  
colour applied during manufacture;  
finish not required; *[2 max]*
- (ii) *Award [2] for something along the lines of:*  
density equates to overall weight of car;  
a plastic body uses less fuel to propel a light car so environmentally sound; *[2 max]*
- (iii) *Award [2] for a suitable outline along the lines of:*  
plastic deformation allows the metal to be permanently shaped by press machines;  
the metal of the body panel needs to be stressed beyond the yield point. *[2 max]*
- (b) (i) *Award [2] for one suitable outline.*  
cost;  
    once set up costs are paid its cheaper to run **or** fewer operators;  
flexibility;  
    easy to change the line to suit the product;  
quality;  
    ensure consistent quality;  
skills;  
    effect on the workforce (fewer skills required); shorter period of operator training. *[2 max]*
- (ii) *Award [1] each for two of:*  
accurate repeatable operation;  
less wastage;  
reduce overheads;  
non-stop operation;  
do not require special environments;  
more precise parts produced;  
reliable;  
reduce labour costs; *[2 max]*

- (c) (i) *Award [1] for a definition something like:*  
development that meets the needs of the present without compromising the  
ability of future generations to meet their needs; **[1 max]**

- (ii) *Award [1] for three points in an appropriate discussion under each heading.*

manufacture;

- safe and environmentally sound;
- no impact on the atmosphere;
- does not radically use new construction techniques;
- liberates human beings;

use;

- non-polluting in use;
- cut down on oil-refinery dependency;
- produce cost savings;
- considered for long-term characteristics;
- value of product should be more than exchange value;

disposal;

- body parts are easily recycled;
- parts could be reused;
- no CFC emissions;
- designed for disassembly;

**[9 max]**

9. (a) (i) Award [1] for perspective drawing; [1 max]

(ii) Award [1] for stating an advantage and [1] for stating a disadvantage from the lists.

advantage:

- physical models can be understood by a non-technical audience;
- a physical model is good for a consultation process;
- physical models are a realistic representation of the real thing;

disadvantage:

- physical models can be expensive to produce;
- physical models take up a lot of room as they need to be built to quite a large scale to show detail;
- physical models can be time consuming to construct;
- physical models may require manual skills;

[2 max]

(iii) Award [1] for identifying a factor and [1] for a brief explanation.

- close enough to provide adequate structure for the roof;
- if they are too far apart roof could fall down;

far enough apart to allow people comfortable access to the reception area of the school;

- if they are too close together access is difficult for delivery trolleys and wheelchairs;

far enough apart to keep costs down;

- if they are too close together then manufacture becomes expensive;

[2 max]

(b) (i) Award [1] for any of questionnaire;  
website;  
interview;  
group discussion;

[1 max]

(ii) Award [1] for identifying an expert and [1] for each distinct point in an explanation.

experts such as teachers/administrators/security/catering/architects' delivery drivers are used to gather information concerning their expertise;

- expert knowledge provides informed decisions;
- (experts working in a group) the sum of the whole is greater than individual parts;
- experts can draw upon previous similar experiences;
- experts working in (for example) a video conference is cost effective;

[3 max]

- (c) (i) Award [1] for identifying a feature and [1] for a brief outline along the lines of:  
noise from adjoining classrooms;  
light partitions may reduce light levels;  
circulation of people partitions may cause access problems; **[2 max]**

- (ii) Award [3] max for three separate points in a suitable discussion along the lines of:

texture;

walls need to be smooth as pupils will rub against them;  
and floors should be non-slip.

noise;

pupils changing class and meeting in groups will make a lot of noise;  
so sound insulation necessary.

light;

for safety;  
corridors need to have good light levels.

temperature;

many people in an enclosed space generates much heat;  
so adequate ventilation required;

colour;

different colours have different effects on children;  
bold primary colours are more stimulating;

**[9 max]**

---