IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
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N06/4/DESTE/SP3/ENG/TZ0/XX/M+

MARKSCHEME

November 2006

DESIGN TECHNOLOGY

Standard Level

Paper 3

20 pages

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

Subject Details: Design Technology SL Paper 3 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in each of **TWO** Options (total ***[15 marks]***). Maximum total = ***[30 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 penalized. 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 penalized 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 penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

Option A — Raw material to final product

A1. (a) *Award **[1]** for effect on toughened glass and **[1]** for effect on laminated glass.*

when broken, toughened glass will shatter into tiny fragments;
laminated glass will crack, but will stay together; ***[2]***

(b) *Award **[1]** for a characteristic, and **[1]** for an explanation of the characteristic and **[1]** for application to the Louvre context.*

transparent;
- lets the light/heat in;
- warms the interior on sunny days;

hard;
- doesn't scratch;
- no damage when cleaning/repairing;

aesthetic;
- gives the structure a light airy feeling;
- provides contrast to the main museum building; ***[3 max]***

A2. *Award **[1]** for the name of the treatment and **[1]** for the description.*

galvanize – protect steel/coat with zinc finish;
electroplate – protect steel/plate with a non-corrosive finish;
paint – protect steel/suitable appearance; ***[2 max]***

A3. *Award **[1]** for understanding of seasoning, **[1]** for a reason*

seasoning reduces moisture content;

seasoned timber is stronger;
lighter;
more stable;
less insect prone;
less prone to decay; ***[2 max]***

A4. *Award **[1]** each for each point in an explanation of nylon up to **[3]**; and **[1]** for each point in an explanation of cotton up to **[3]**.*

Nylon:
nylon is synthetic/man made;
the desired characteristics can be introduced into the production process;
the nylon fibre is non-absorbent;

Cotton:
cotton is naturally absorbent;
treatment for the desired characteristics must be introduced after the processing of the cotton;
cotton is degraded by moisture, so when treated has a longer life; ***[6 max]***

Option B — Microstructures and macrostructures

B1. (a) *Award **[1]** each for two points.*

linear chains;
hydrocarbon rings;
linear chains are like rigid rods;
chains aligned along length of fibre;
high tensile structure; ***[2 max]***

(b) *Award **[1]** for a reason and **[1]** for two points in an explanation.*

flexibility;
fibres are non-stretch;
weave makes the housing flexible;

ease of manufacture;
fit the shape;
versatile application;

provide structure;
hold the aluminium spiral in shape;
maintain round cable shape; ***[3 max]***

B2. *Award **[1]** for a reason and **[1]** for elaboration.*

high tensile strength;
does not stretch;

low absorbency;
fibres are water resistant; ***[2 max]***

B3. *Award **[1]** for a reason and **[1]** for brief outline.*

ductile material can be drawn into a wire;
easy to manufacture for a cable; ***[2]***

B4. *Award **[1]** for each of two reasons and **[2]** for each of two explanations.*

kitchen work surface often has hot objects placed on it;
thermoset and thermoplastic respond differently to heat;
thermoset is more appropriate;

thermoset has non reversible structure;
thermoset structure includes permanent cross links;
thermoset may scorch but at much higher temperatures;
thermoplastic will change structure when heated;
thermoplastic will melt when heated; ***[6 max]***

Option C — Appropriate technologies

C1. (a) *Award **[1]** for an advantage and **[1]** for a disadvantage.*

advantages
low fuel costs;
no pollution from burning fuel;
readily available source;

disadvantages
less government income from fuel sales;
people in fuel industry out of work; ***[2 max]***

(b) *Award **[1]** for the identification of a proposal, and **[2]** for how it relates to a hydrogen car.*

environmentally sound transport system;
does not cause pollution;
minimizes waste;

sustainable energy consumption;
uses renewable energy source;
does not deplete limited resources;

prevent ozone depletion;
does not exhaust hydrocarbons;
no effect on ozone; ***[3 max]***

C2. *Award **[1]** each for two barriers.*
high cost of recovery and processing;
properties of the material may prevent or limit recycling;
consumer resistance to using waste based products;
product specifications may prevent recycling; ***[2 max]***

C3. *Award **[1]** for each definition.*
renewable – naturally replenish in a short time;
non-renewable – resources that take too long for natural processes to replenish them (> 1 lifetime); ***[2]***

C4. *Award **[1]** for each of two reasons, and **[2]** for each point in an elaboration of each reason.*

use clean processes;
- minimize pollution;
- minimize waste of non renewable resources;

decrease use of non renewable resources;
- more sustainable industries;
- decrease pollution;

use energy efficiently;
- less depletion of resources;
- use less energy;

use more people-friendly production processes;
- processes should liberate people rather than controlling them;
- the workforce would be more stable/less turnover; ***[6 max]***

Option D — Food technology

D1. (a) *Award **[1]** each for two points.*

sun drying causes dehydration;
the drying of the fish prevents microbial growth; ***[2]***

(b) *Award **[1]** for the method, **[2]** for an explanation of two points about the method.*

method:
cooking;
canning;
irradiation;
chemical preservation;
control of food atmosphere;
smoking;

explanation:
minimizing contamination;
killing microorganisms;
preventing microbial growth; ***[3 max]***

D2. *Award **[1]** each for two points.*

selling the fish fresh adds no value to the product;
processing the fish on the farm value-adds to the product;
income is retained in the community;
provides more jobs for the local community; ***[2 max]***

D3. *Award **[1]** each for two points.*

promote a sales slogan;
provide nutritional information;
attract customers to the product;
highlight the “green” process of drying;
help ensure cleanliness in handling the product;
allow for distribution to wider markets; ***[2 max]***

D4. *Award **[1]** each for two issues and **[1]** for each point up to **[2]** in a discussion of the issue.*

food balance;
- protein;
- starch;
- fat;
- essential fatty acids;
- vitamins;
- minerals;
- fibre;
- food group systems are a way of helping to plan a healthy diet;

energy;
- food must provide enough energy;
- intake matches the lifestyle of the person;

personal needs;
- requirements will vary according to age;
- health;
- sex;
- activity;

[6 max]

Option E — Computer-aided design, manufacture and production

E1. (a) *Award **[1]** for reason and **[2]** for explanation.*

because CAD is a computer based design method;

enables designers to work concurrently;
provides for flexibility in designing;
accessibility by all designers to ongoing projects; ***[3 max]***

(b) *Award **[1]** for each advantage **[2 max]**.*

facilitates team work;
saves time;
maximizes specialist knowledge; ***[2 max]***

E2. *Award **[1]** for a device **[2 max]**.*

printer;
plotter;
rapid prototyper;
CNC machine;
screen/projector; ***[2 max]***

E3. *Award **[1]** for the reason and **[1]** for brief summary.*

the design is computer based;
and so can be easily modified to suit customers needs;
will increase the efficiency of the process; ***[2]***

E4. *Award **[1]** for an advantage and a disadvantage, and **[2]** for the explanation of each.*

Advantage:
- cheaper products;
- manufacturers save on storage space;
- increased efficiency;
- less capital investment;
- customer satisfaction;
- customer feels more involved;
- more feedback;

disadvantage:
- possible delays in delivery;
- no supply of goods in stock;
- only manufactured or ordered when customer needs them;
- lack of trust in the company;
- reputation of the company may suffer;

[6 max]

Option F — Invention, innovation and design

F1. (a) *Award **[1]** for a reason and **[1]** for a brief summary.*

optical fibres and clear plastic are the invention;
these have been combined into a bag and successfully marketed; ***[2]***

(b) *Award **[1]** each for three points in the explanation.*

ahead of competitors by introducing a new product first;
financially risky;
potentially large profits; ***[3]***

F2. *Award **[1]** for each of two points in the outline.*

designer gone back to original purpose of a bag;
developed a new solution using new materials; ***[2]***

F3. *Award **[1]** for one impact and **[1]** for a point in a brief summary.*

batteries;
non recyclable;
environmentally damaging;

materials;
high energy costs in manufacture;
not recyclable unless dismantled; ***[2 max]***

F4. *Award **[1]** each for an explanation of the two terms, and **[2]** for an elaboration of each term;*

technology push: impetus for new design comes from technological development;
clear plastic as a technological development;
optical fibres as a technological development;
process of weaving optical fibres into fabric;

market pull: impetus for new product comes from market demand;
demand from market for innovative products;
segmented market demand – *e.g.* young people; ***[6 max]***

Option G — Health by design

G1. (a) *Award **[1]** for each of two points.*

provide a biological link between the natural and unnatural material;
a framework for the growth of new tissue; ***[2]***

(b) *Award **[1]** for each of three types of testing.*

tested with living cells/tissue;
chemical testing for contamination or breakdown;
testing for chemical leaching;
morphological examination of surface materials;
physical/mechanical tests for strength and toughness; ***[3 max]***

G2. *Award **[1]** each for two properties.*

dense;
hard;
strong;
stiff;
tough;
impermeable;
non-corrosive; ***[2 max]***

G3. *Award **[1]** each for a disadvantage and **[1]** for an advantage of soft lenses.*

advantages:
comfort;
disposable;
less chance of infection;
less cleaning;

disadvantages:
less durable;
does not maintain shape;
absorb pollutants; ***[2 max]***

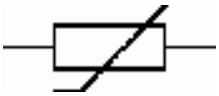
G4. *Award **[1]** for each of six points in an explanation.*

anti-legislation pressure groups work against the legislation;
adds costs to motor car manufacture;
manufacturers may sell less cars because of higher costs;
legislation does not cover manufacturing in other countries;
countries with lax legislation may sell many cars;
lower car sales may effect the economy;
emission controls may effect vehicle performance;
higher transport costs may effect the economy adversely; ***[6 max]***

Option H — Electronic products

H1. (a) *Award **[1]** for name and **[1]** for drawing of symbol.*

thermistor

 ;

[2 max]

(b) *Award **[1]** for explanation and **[1]** each for two examples.*

explanation:
the rules govern the heating system and allow it to operate automatically;

examples:
IF temperature is cold THEN fan speed high;
IF temperature is hot, THEN fan off; ***[3]***

H2. *Award **[1]** for two steps in the process up to four steps **[2 max]**.*

silicone base;
cover with photoresist;
expose circuit pattern;
wash / dissolve the photoresist;
etch the circuit pattern;
strip / wash the photoresist; ***[2 max]***

H3. *Award **[1]** each for two appliances.*

washing machine;
microwave oven;
oven;
refrigerator;
dishwasher;
coffee machine; ***[2 max]***

H4. *Award **[1]** for each of two advantages and **[2]** for explanation of each advantage.*

advantage:
flexible;
more compact;
cheaper;

explanation:
flexible: can be reprogrammed to perform different functions;
more compact: smaller so can be integrated into smaller devices;
cheaper: can be used for a number of tasks, and so doesn't require a new system for each task; ***[6 max]***