IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

M06/4/DESTE/SP3/ENG/TZ0/XX/M

MARKSCHEME

May 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.

Option A — Raw material to final product

A1. (a) *Award **[1]** for each material.*
a diamine/diamide;
adipic acid; ***[2]***

(b) *Award **[1]** each for a short sentence on each of the **three** processes.*
cleaning;
washing away foreign particles;
combing;
brushing the cotton fibres;
spinning;
spin fibers into thread; ***[3]***

A2. *Award **[1]** for each reason.*
it will not rust;
it is strong/hard/stiff;
abundant material; ***[2]***

A3. *Award **[1]** each for the **two** points.*
toughened glass will shatter;
laminated glass may crack but cracks will not spread; ***[2]***

A4. *Award **[1]** for the identification of a reason **[2 max]** and **[2]** for the explanation of each reason.*
waterproof;
cotton is absorbent;
so needs to be treated for waterproofing;

degradation;
cotton is degraded by ultraviolet rays/sunlight;
cotton is degraded by air pollutants;
so needs to be treated for these;

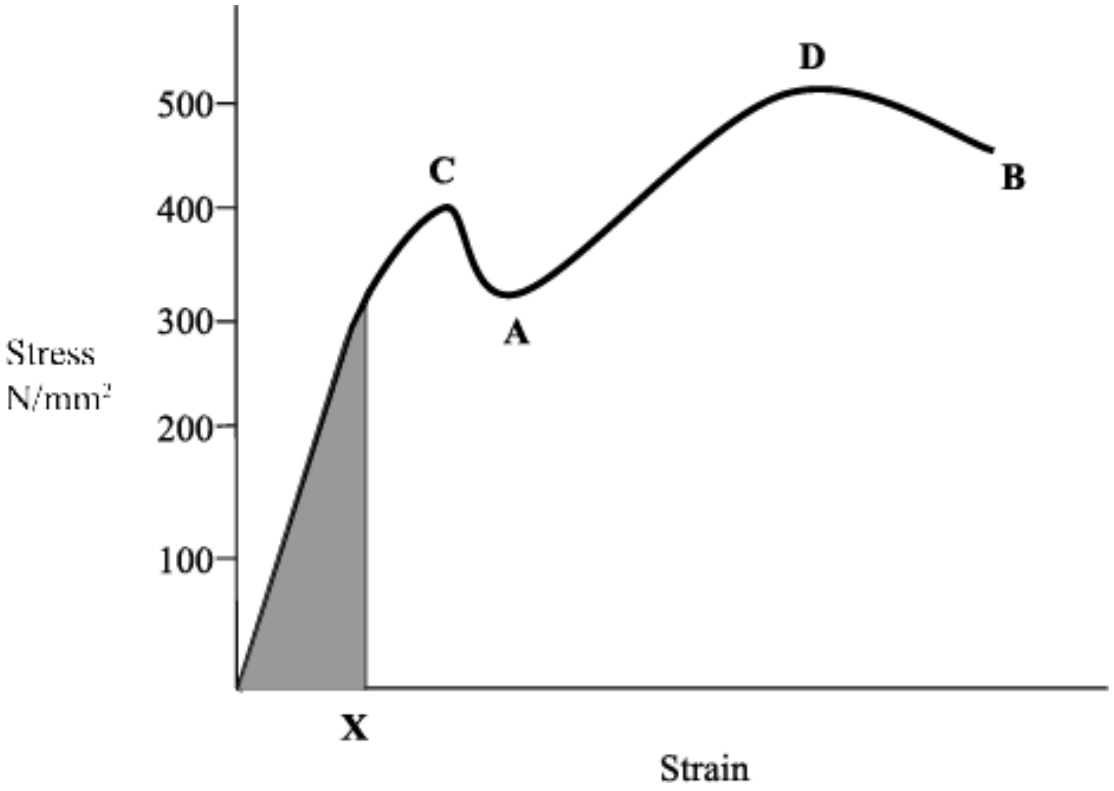
hardwearing;
cotton will wear in abrasive situations;
chemical treatments make the fabric tougher;

less flammable;
danger of cooking outdoors;
dry cotton burns easily; ***[6 max]***

Option B — Microstructures and macrostructures

B1. (a) *Award **[1]** for the correct value of the yield stress and **[1]** for identifying point D.*
yield stress – 400 N/mm^2;
ultimate stress = D; ***[2]***

(b) *Award **[2]** for shading the area bordered by the curve and the horizontal axis and a vertical line from X.*



B1 Stress-Figure strain curve

[2]

B2. *Award **[1]** for each distinct point in an evaluation of strain.*
members supporting the deck are under strain;
load must be within the members elastic limit;
if stressed beyond the limit of the material, it will fail; ***[3]***

B3. *Award **[1]** for each of two points.*
the added alloy distorts the regular metal lattice;
the layers are then more difficult to move over each other, increasing tensile strength; ***[2]***

B4. *Award **[1]** for each distinct point in an explanation.*
deformation occurs;
layers of atoms sliding over one another;
as this sliding occurs, the metal grains become distorted / the atom layers buckle;
there is a rapid increase of dislocations within the grains;
because of the dislocation further deformation becomes more difficult;
and the metal becomes harder; ***[6]***

Option C — Appropriate technologies

C1. (a) *Award **[1]** for each point in a discussion.*
electricity costs less;
because it is generated from waste;

heat costs less;
because it is generated from waste;

no energy is consumed;
by having to remove the waste;

self sufficient;
advantage to the community in being;
fertilizer becomes an income stream;

manure disposal no longer a problem;
less pollution;
solves waste management problem; ***[2 max]***

(b) *Award **[1]** for the example and **[2]** for two points in the explanation **[3max]**.*
location;
biogas plant located near the source of waste;
so waste doesn't have to be transported;

integrated mechanisms;
facilities for spreading fertilizer integrated into the design;
to make it easy for collection and distribution;

energy conservation;
farm consumes energy;
system produces cheap energy; ***[3 max]***

C2. *Award **[1]** for each of two points in an outline.*
it meets the needs of the present;
helps ensure that future needs will also be met by not using a finite resource; ***[2]***

C3. *Award **[1]** for each point in an outline.*
small scale;
energy efficient;
alternative to current mainstream;
new equipment or organizational forms; ***[2 max]***

C4. *Award **[1]** for the identification of an issue and **[2]** for two points in a discussion.*

employment;
- some people may lose their jobs;
- opportunities for retraining should be provided;

income generation;
- basis of income generation may change;
- may be a loss of income;

cost-benefit analyses;
- maybe some costs involved;
- not immediately economical;
- environmental vs manufacturing costs;

human displacement;
- location of people's activities may be forced to change;
- people may be forced to relocate;

[6 max]

Option D — Food technology

D1. (a) *Award **[1]** for each type of information.*
expiry date;
safe storage details;
serving information;
ingredients;
additives;
warnings; ***[2 max]***

(b) *Award **[1]** for the identification of a food product, and **[1]** for each of the health-conscious reason for its development.*
low fat milk;
desire not to be overweight;
desire to consume less fatty foods;

naturally sweetened candy;
consume less sugar;
avoid infected teeth;

modified with additives;
balanced nutritious diet;
certain vitamins needed; ***[3 max]***

D2. *Award **[1]** for each of two points in a description.*
pasteurization involves heating;
heat kills the micro-organisms/harmful bacteria;;
[2 max]

D3. *Award **[1]** for each of two points in a list.*
protein;
fat;
carbohydrate; ***[2 max]***

D4. *Award **[1] each** for identifying an advantage and a disadvantage **[2 max]** and **[2]** each for an explanation of an advantage and a disadvantage **[4 max]**.*

advantage

- labelling;
  - to give important consumer information;
  - opportunity for product promotion;
- preservation;
  - packing keeps the product free of contaminants;
  - provides for a longer shelf life;
- containerization;
  - ease of transport;
  - ease of storage for customer and retailer;

disadvantage

- increase costs;
  - packaging adds to the cost of the product;
  - increases time from production to delivery;
- pollution;
  - disposal may be a pollutant if not biodegradable;
  - disposal becomes consumers responsibility; ***[6 max]***

Option E — Computer aided design, manufacturing and production

E1. (a) *Award **[1]** for each of two points.*
quick response to design changes;
graphic and clear presentation of ideas;
enhanced communication/consumers can understand designers ideas/ideas sent over distance, e.g. internet; ***[2 max]***

(b) *Award **[1]** for naming a criteria and **[2]** for stating the reason why.*
desired outcome;
- type of interiors to be designed;
- how images are to be presented;
- format for clients to read;

time;
- time to learn package;
- time to develop images required;
- extensive training required;

cost;
- relate to size of organization/volume of production;
- becomes a fixed cost of production;

extra features;
- features to suit the type of modelling;
- such as walk-throughs;
- provide production drawings;

designers needs;
- able to paste in furniture and backgrounds;
- extensive library of components;
- provides all essential features; ***[3 max]***

E2. *Award **[1]** for identifying the resource and **[1]** for why it conserves resources.*
time;
- may use previous designs and change them;

materials;
- done on computer, so less materials used;

energy;
- no materials for physical models need to be produced or processed; ***[2 max]***

E3. *Award **[1]** for each point in a list of two points.*
new skills required/training;
cleaner work environment with CAM;
work may be done in remote location;
may get laid off because fewer workers required/redundancies;
safer working environment; ***[2 max]***

E4. *Award **[1]** for the identification of each reason and **[2]** for the explanation of each reason.*

saves on storage space;
only produces what is needed;
less need for storage;

reduced overheads/fewer unsold items;
less money tied up in inventory;
less danger of unsold surplus;

reduced capital investment;
funding available for other business needs;
potential for higher profits;

ease of communication;
components etc can be viewed by clients;
reliability of deliveries can be ensured to avoid stockpiles;

less labour;
Not moving stock around so much;
Less security requirement; ***[6 max]***

Option F — Invention, innovation and design

F1. (a) *Award **[1]** for each distinct point in a description.*
it is an adaptation of a previously existing design/small change;
the pump is now in a new location;
more versatile bicycle seat; ***[2]***

(b) *Award **[1]** for the invention, and **[2]** for why it was important.*
synthetic rubber;
cheaper;
could be mass produced;

valves;
enabled pneumatics;
controlled air pressure;

pump;
required to get air into the tube;
required for owner to be able to replace leaked air;

jointing techniques;
rubber fusion to metal;
enabled in-built valves; ***[3 max]***

F2. *Award **[1]** for each of two reasons.*
fear of theft of pump;
extra additional expense of pump above initial purchase;
pumps getting lost;
pump with the bike all the time;
improve bike aesthetics;
increased popularity of cycling; ***[2 max]***

F3. *Award **[1]** for the point of comparison and **[1]** for a comment.*
influence;
LI less influential than the PC;

business acumen;
PC more that LI;

objectivity;
PC more than LI who is more emotionally involved;
LI may be moe dogmatic and less flexible than PC;

Creativity;
LI creative in design;
PC creative in business;

Access to finance;
LI more likely than PC; ***[2 max]***

F4. *Award **[1]** each for **two** demands **[2 max]** and **[2]** each for **two** reasons **[4 max]**.*

cheap transport;
- continued need for mass production;
- alternative to more expensive transport;

exercise;
- people use bikes as a form of exercise;
- enables people to keep fit;

aesthetics;
- some bikes are a status symbol;
- fashion is an important criteria for some;

competition;
- need for light weight;
- durable / ergonomic;

specialist markets;
- mountain bike;
- folding bike;
- BMX;
- racing *etc;*

safety;
- developments in making cycling safer e.g. brake design;
- ergonomics of layout;
- lighting;

comfort;
- suspensions;
- saddle;

shortage of storage space:
- homes smaller;
- produce bikes that easily take apart;
- folding bikes;

ease of transporting on public transport /car;
- light weight;
- produce bikes that easily take apart;
- folding bikes;

lighter bike;
- less effort to ride;
- easier to transport;

ease of use of gears:
- be able to select gear ratio required at any time;
- integrated grip gears;

green transport;
uses no fossil fuel while being used;
has long life expectancy;/easy to repair

[6 max]

Option G — Health by design

G1. (a) *Award **[1]** for each criteria.*
surface should not encourage blood clots;
should be compliant / elastic;
maintain long term tensile strength;
must be biocompatible;
uniform volume production;
withstand repeated sterilization;
available in a variety of sizes; ***[2 max]***

(b) *Award **[1]** for a difference and **[2]** for explaining the difference.*
stability;
weave is dimensionally stable;
knitting is not dimensionally stable;

porosity;
weave has low permeability;
knitting is very porous;

flexibility;
low for weave;
high for knitting;

strength;
weave has a high bursting strength / good fatigue resistance;
knitting is less strong; ***[3 max]***

G2. *Award **[1]** for the identification of a development and **[1]** for its description.*
lowered rejection rates;
incubation of cells on the prosthesis to avoid rejection;

computer modelling;
computer models used to optimize design and simulate fabrication;

multi dimensional walls;
thicker walls at the ends to make attachment easier; ***[2 max]***

G3. *Award **[1]** for a reason and **[1]** for an expansion of the reason.*
Impervious / porosity;
Most metals are non-porous;

Biocompatibility;
Most metals are biocompatible;

Ease of manufacture;
Metals suitable for volume production; ***[2 max]***

G4. *Award **[1]** for each point in an explanation **[6 max]**.*
Pro Osteon is developed from coral into hydroxyapatite;
the same material as bone with a similar pore structure;
material provides a matrix;
new bone tissue can grow in the matrix;
material functions as bone temporarily;
material can be sharp; ***[6]***

Option H — Electronic products

H1. (a) *Award **[1]** for a statement of a use and **[1]** for a point in an outline.*
Reacting to light;
closing curtains when the light gets bright;

turning lights off;
at sunrise, switching lights off;

any e.g. where an action is taken by a motor as a result of increasing light conditions ***[2 max]***

(b) *Award **[1]** for identifying the component as a diode and **[2]** for two points in an explanation.*
diode;
protects the relay;
allows electricity to flow in only one direction; ***[3]***

H2. *Award **[1]** for each point in a description.*
amplify a low/small input voltage;
can be inverting or non-inverting;
can compare two input voltages; ***[2 max]***

H3. *Award **[1]** for an indication in the diagram of closed loop and **[1]** for an indication of open loop.*
Diagram must indicate the following:

closed loop will have a complete circuit;
open loop will have opportunity for variable input at some place in the circuit; ***[2]***

H4. *Award **[1]** each for naming two impacts **[2 max]** and **[2]** each for a discussion of the impacts **[4 max].***
Mobility;
Products are small so easier to carry;
People are not encumbered with products and so are more mobile;

Convenience;
Easy to carry products;
More convenient to carry them all the time;

Communication;
Communication products (phone, music) easy to carry;
People inclined to communicate more; ***[6 max]***