IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
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N04/4/DESTE/SP2/ENG/TZ0/XX/M

MARKSCHEME

November 2004

DESIGN TECHNOLOGY

Standard Level

Paper 2

13 pages

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

General Marking Instructions

After marking a sufficient number of scripts to become familiar with the markscheme and candidates' responses to all or the majority of questions, Assistant Examiners (AEs) will be contacted by their Team Leader (TL) by telephone. The purpose of this contact is to discuss the standard of marking, the interpretation of the markscheme and any difficulties with particular questions. It may be necessary to review your initial marking after contacting your TL. **DO NOT BEGIN THE FINAL MARKING OF YOUR SCRIPTS IN RED INK UNTIL YOU RECEIVE NOTIFICATION THAT THE MARKSCHEME IS FINALISED.** *You will be informed by e-mail, fax or post of modifications to the markscheme and should receive these about one week after the date of the examination. If you have not received them within 10 days you should contact your Team Leader by telephone. Make an allowance for any difference in time zone before calling.* **AEs WHO DO NOT COMPLY WITH THESE INSTRUCTIONS MAY NOT BE INVITED TO MARK IN FUTURE SESSIONS.**

1. Follow the markscheme provided, do **not** use decimals or fractions and mark only in **RED**.

2. Where a mark is awarded, a tick (✓) should be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark.

3. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases write a brief annotation in the **left hand margin** to explain your decision. You are encouraged to write comments where it helps clarity, especially for moderation and re-marking.

4. Unexplained symbols or personal codes/notations on their own are unacceptable.

5. Record subtotals (where applicable) in the right-hand margin against the part of the answer to which they refer (next to the mark allocation for Section A). Do **not** circle sub-totals. **Circle the total mark for the question in the right-hand margin opposite the last line of the answer.**

6. For Section B, show a mark for each part question (a), (b), *etc*.

7. Where an answer to a part question is worth no marks, put a zero in the right-hand margin.

8. Section A: Add together the total for each question and write it in the Examiner Column on the cover sheet.
Section B: Insert the total for each question in Examiner Column on the cover sheet.
Total: Add up the marks awarded and enter this in the box marked TOTAL in the Examiner Column on the cover sheet.

9. After entering the marks on the cover sheet check your addition to ensure that you have not made an error. Check also that you have transferred the marks correctly to the cover sheet. **We have script checking and a note of all clerical errors may be given in feedback to examiners.**

10. Every page and every question must have an indication that you have marked it. Do this by **writing your initials** on each page where you have made no other mark.

11. If a candidate has attempted more than the required number of questions within a paper or section of a paper, mark only the required number of questions in the order in which they are presented in the paper, unless the candidate has indicated the question(s) s/he wants to be marked on the cover sheet.

12. A candidate can be penalised if he/she clearly contradicts him/herself within an answer. Make a comment to this effect in the left hand margin.

Subject Details: Design Technology SL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in Section A (total 20 marks) **and any ONE** question in Section B (20 marks each). Maximum total = 40 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 penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

SECTION A

1. (a) (i) 26 m x 27 m;
= 702 m^2; ***[2 max]***

(ii) 1 cm on plan = 2 m **OR** 200 cm;
scale is 10:2000 **OR** 1:200; ***[2 max]***

(b) (i) *Award **[1]** for an appropriate reason, e.g.:*
so students can do computer aided design;
so students can access spreadsheet package for mathematical modelling;
computers are an important element of design technology and to not have them in a new facility would be inappropriate; ***[1 max]***

(ii) *Award **[1]** for an appropriate reason, e.g.:*
so students can access help easily;
so the technician can see what is going on easily; ***[1 max]***

(iii) *Award **[1]** for why Stores 1 and 3 have 2 sets of doors and **[1]** for why store 2 has only 1 set of doors, **[2 max]***
double doors allow materials and equipment to be delivered straight into Stores 1 and 3 from outside;
whereas Store 2 with the single set of double doors would be used to store work in progress between classes;
the single set of double doors in Store 2 provides more usable wall space; ***[2 max]***

(c) (i) *Award **[1]** for the name of a piece of equipment that could be used for working timber, **[1 max]**.*
e.g. lathe;
router;
saw;
sander;

(ii) *Award **[1]** per distinct point in an appropriate explanation, **[3 max]**.*
various cutting and machining operations cause dust;
dust in the air would be breathed in by people in the department;
dust can cause severe respiratory problems;
dust can damage machines including computers;
dust can make some floors slippery;
dust can be a fire hazard;

2. (a) *Award **[1]** for a definition to the effect of **[1 max]**.*
the mass per unit volume of a material; ***[1 max]***

(b) *Award **[1]** per distinct point in an appropriate explanation, **[3 max]**.*
product packaging needs to be low density;
this will ensure that the weight of the product during distribution is minimised;
this will keep energy usage during distribution at a minimum; ***[3 max]***

3. (a) *Award **[1]** for a definition to the effect of: **[1 max]**.*
the assessment of the effect that a product has on the environment from the initial concept to disposal; ***[1 max]***

(b) *Award **[1]** mark per distinct appropriate point in an explanation of **one** way in this the pre-production stage can reduce the environmental impact of a washing machine, e.g. relating to the design or to the manufacture of the washing machine **[3 max]**.*
design is included in the pre-production stage;
designer can design washing machine to use recycled materials **OR** materials which can be recycled more easily **OR** to use standard parts **OR** to be more energy-efficient **OR** to be easy to disassemble **OR** to use fewer parts;
this will reduce the environmental impact;
manufacturing decisions are made pre-production;
manufacturer can select clean technology for manufacturing;
this can reduce the environmental impact of the washing machine; ***[3 max]***

SECTION B

4. (a) (i) *Award **[1]** for any response from the following:*
thermal expansion;
hardness;
thermal conductivity;
density;
elasticity; ***[1 max]***

(ii) *Award **[1]** mark for an appropriate health and safety consideration and **[1]** mark for a brief explanation **[2 max]**;*
e.g. flammability;
does the material burn to give off toxic fumes; ***[2 max]***

(iii) *Award **[1]** mark for each distinct point in a brief description **[2 max]**;*
the legs are produced by bending a metal rod;
ductility enables this to be performed cold without fracturing the metal; ***[2 max];***

(b) (i) *Award **[1]** for each of two responses from the following list **[2 max]**;*
materials cost;
labour cost;
manufacturing cost;
storage cost;
sales/distribution cost; ***[2 max]***

(ii) the final cost of the product will reflect the total of the variable costs for each individual item;
plus a proportion of the fixed costs which depends on the number that the manufacturer has decided is the breakeven number; ***[2 max]***

(iii) the manufacturer has to decide on a breakeven point *i.e.* the number of units over which the fixed costs will be spread);
this is used a s a divisor for the fixed costs and this figure is reflected in the final cost of the product; ***[2 max]***

(c) *Award **[1]** for identifying an appropriate method of joining which could be applied in the manufacture of the chair plus **[1]** mark for each distinct point in a brief explanation **[3 max]** per method **[9 max in total]**;*

Please note other appropriate methods may be identified e.g. ultra sonic welding.

using fasteners;
the fasteners used could be screws or rivets;
these could be used to join the legs to the seat or the seat cover to the base;

adhesives;
an appropriate adhesive could be used to join the plastic parts together or the seat cushion to the seat base;
the adhesive will be selected according to the materials being joined;

stitching;
the synthetic textile material for the seat cover could be stitched together;
the stitching may also form a decorative element on the chair;

Fusing;
the plastic materials for the seat could be fused together;
fusing might be used as an alternative to stitching or adhesives; ***[9 max]***

5. (a) (i) *Award **[1]** mark for an appropriate piece of anthropometric data and **[1]** for a brief explanation **[2 max]**;*
size of hands;
so that the device can be handled easily; ***[2 max]***

(ii) *Award **[1]** for an appropriate psychological or physiological factor and **[1]** for a brief explanation **[2 max]**;*
texture of the material;
so it can be handled easily and comfortably;
pitch and level of sound output;
so it is audible but not too intrusive; ***[2 max]***

(iii) *Award **[1]** for an appropriate advantage of using a user trial and **[1]** for a brief explanation **[2 max]**;*
user trials are cost-effective;
they provide valuable data on which to refine a product; ***[2 max]***

(b) (i) injection moulding;

(ii) *Award **[1]** for an advantage and **[1]** for a disadvantage from the following lists **[2 max]***
Advantage:
it's quicker to produce as a physical model is made from materials;
it's easier to make changes – at the touch of a button;
it's easier for people to gain access to the model, *i.e.* by their computer;
practical skills are required to make a good physical model;
workshop facilities are required to make the physical model;

Disadvantage:
CAD modelling requires an expensive computer and software;
CAD modelling requires significant amount of training; ***[2 max]***

(iii) *Award **[1]** for each of two responses from the following list **[2 max]**;*
good tensile strength;
stiff;
tough; ***[2 max]***

(c) *Award **[1]** mark for each distinct point, **[3 max]** for each of manufacturing, distribution and marketing **[9 max total]**;*

manufacturing costs *[3 max]*

injection moulding is very expensive owing to the high capital cost of the die;
the item is to be batch-produced, which is not high volume, so economies of scale are not good unless there is a large market;
the product is manufactured by automation, so labour costs will be low;

distribution costs *[3 max]*

as a small batch-produced item, storage costs will be low;
for a specialised market, distribution and sales costs will be low;
these costs will not have a major impact on the final cost of the product;

marketing costs *[3 max]*

although it is a specialised market it could be quite large globally;
limited and targeted advertising is needed;
marketing costs are unlikely to make a major contribution to the cost of the product;

6. (a) (i) Stitching;

(ii) *Award **[1]** per distinct point in a description **[2 max]***
plywood is made from thin layers of timber;
joined together with an adhesive; ***[2 max]***

(iii) *Award **[1]** for an appropriate reason why plywood would have been selected and **[1]** for a brief explanation, **[2 max]**;*
the original radio on which the design is based would most likely have been made from plywood;
so using plywood gives an authentic feel;
the case material affects sound quality;
plywood would enhance the sound quality of the product; ***[2 max]***

(b) (i) *Award **[1]** for each of two responses from the following list **[2 max]**;*
accountants;
marketers;
manufacturers;
production engineers;
sales people;
distribution staff;
retailers;
electronic engineer ***[2 max]***

(ii) *Award **[1]** for each of two responses from the following list **[2 max]**;*
impact of the production of the product on the environment;
impact of the product on the environment during product use;
impact of the product on the environment on disposal;

(iii) *Award **[1]** for an appropriate ergonomic disadvantage and **[1]** for a brief explanation **[2 max]**;*
the Sony radio has no handle;
this will make it difficult to carry; ***[2 max]***

(c) *Award **[1]** per distinct point – **[3 max]** for **[9 max total]**.*

problems with the choice of a thermoset for the body of the Sony radio *[3 max]*

the product is portable and will be subject to being carried around and possibly dropped;

thermosets crack easily;

cracks in the body would not be able to be mended and thus the product would become obsolete;

constructive discontent *[3 max]*

complaints can help a designer identify constructive discontent;

customer complaints are effectively long-term user trials and result in the identification of specific problems with the design that need to be addressed;

consistent problems with the design, *e.g.* cracks in the body, would need to be re-designed;

redesign of the product *[3 max]*

this might result in the use of a less brittle plastic material;

or in redesigning the outer case to ensure that it does not crack so easily;

some changes might result in redesign of the die for injection moulding of the case and some may not;