IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
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N04/4/DESTE/HP3/ENG/TZ0/XX/M

MARKSCHEME

November 2004

DESIGN TECHNOLOGY

Higher Level

Paper 3

12 pages

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 FINALIZED.** *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 penalized 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 HL Paper 3 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in each of **TWO** Options (total ***[20 marks]***). 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 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 D – Food Technology

D1. (a) *Award **[1]** for each of two factors that influence the ease of microbial spoilage **[2 max]**.*
pH/acidity;
a_w/water activity;
nutrient content;
temperature; ***[2 max]***

(b) *Award **[1]** per distinct point in an appropriate description.*
canning extends the safe storage life of tomatoes by:
killing microorganisms with heat;
preventing recontamination of the food by the food packaging – the can; ***[2 max]***

(c) *Award **[1]** for identifying an organoleptic property of tomatoes affected by canning and **[1]** for a brief explanation.*
texture;
canning affects the cellular structure and softens the tomato;
smell;
canning gives the tomatoes a cooked smell;
taste;
canning gives the tomatoes a cooked taste;
appearance;
canned tomatoes lose their shape as the texture softens;
sound;
fresh tomatoes would make a different sound when bitten into or cut; ***[2 max]***

D2. *Award **[1]** mark for identifying an alternative packaging option and **[1]** for a brief explanation **[2 max]**.*
glass jars;
tomatoes could be heat treated and then stored in glass jars;
sealed plastic packages;
tomatoes again could be heat treated and then stored in sealed plastic packages; ***[2 max]***

D3. *Award **[1]** mark per distinct point **[3 max]**.*
processing increases the value of food commodities;
if the farmer sells these higher value products to consumers then a larger share of the "food dollar" remains on the farm;
processing the jobs creates jobs for local people and circulates more money in the rural economy; ***[3 max]***

D4. *Award **[1]** for each of the three problems with existing agricultural practices plus **[1]** for each distinct point in an explanation; **[3 max]** per way; **[9 max total]**;*

degradation of soil quality;
use of synthetic chemicals rather than natural fertilizers results in loss of water retaining fibre from soil;
organic practices utilize natural fertilizers and restores water retaining properties to the soil;

pollution of soil, water and food with pesticides and nitrates;
use of pesticides and synthetic fertilizers pollutes soil and food products;
leaching of chemicals from soil pollutes water courses and can kill fish and other aquatic species;

health effects on farmers, farm workers, farm families and rural communities;
pesticides are toxic and can cause harm to people near to sites where they are used;
organic agriculture does not use these chemicals and controls pests by natural means;

resistance of pests to pesticides;
pesticides become less effective with time as pests gain resistance;
they have to be using increased quantities to retain efficiency;

dependence on expensive off-farm inputs and increased reliance on credit facilities;
pesticides and other synthetic agricultural chemicals are expensive;
as costs rise, farming becomes increasingly marginal and unprofitable;
farmers rely more on credit which makes farming less secure; ***[9 max]***

Option E – Computer-aided Design, Manufacture and Production

E1. (a) *Award **[1]** for identifying the strategy used and **[1]** for a brief explanation, **[2 max]**;*
assemble to order;
they hold components and assemble the product to order; ***[2 max]***

(b) *Award **[1]** for identifying the strategy used and **[1]** for a brief explanation, **[2 max]**;*
fabricate to order;
they hold raw materials and produce components to order to assemble product; ***[2 max]***

(c) *Award **[1]** per distinct relevant point within a brief explanation, **[3 max]**;*
relationship between manufacturer becomes a direct relationship,
not mediated through a third party – the retailer;
the manufacturer customizes the product according to the customer's specific requirements; ***[3 max]***

E2. *Award **[1]** per distinct point from list below **[2 max]**;*
the manufacturer has a "buffer" of goods in stock in case of unforeseen circumstances, *e.g.* non-delivery of supplies;
the manufacturer can respond quickly to a demand for a product;
the manufacturer can produce a steady flow of product;
the manufacturer can maintain a stable workforce; ***[2 max]***

E3. *Award **[1]** for identifying a way in which virtual reality would help the company and **[1]** for a brief explanation, **[2 max]**.*
e.g.:
simulate product;
enable customer to visualize what they are ordering; ***[2 max]***

E4. *Award **[1]** for identifying each appropriate advantage or disadvantage and **[1]** mark for each distinct point in an explanation **[3 max]**, **[9 max total]**.*
creates jobs for local people;
each unit will employ local labour;
this helps money circulate in the local economy;

products can be customized to meet the needs of local markets;
markets differ across the globe, *e.g.* in terms of legislative requirements;
each production unit can respond more effectively to its specific market;

reduction in distribution costs;
locally produced products will be cheaper to distribute;
this makes them more accessible to local communities;

products may not be consistent with local values and culture;
erosion of local culture and values can lead to deterioration in society;
this can have major impacts particularly on young people; ***[9 max]***

Option F – Invention, Innovation and Design

F1. (a) *Award **[1]** for a reason and **[1]** for a brief explanation, **[2 max]**;*
the refrigerator freezer is a complex product and relies on expertise from a range of disciplines;
the expertise of one person, the lone inventor, is unlikely to be appropriate; ***[2 max]***

(b) *Award **[1]** for each appropriate response from the list below, **[2 max]**:*
it may not be successful in the marketplace;
it may not get appropriate financial support;
it may not be marketed properly;
it may not be priced correctly; ***[2 max]***

(c) *Award **[1]** for each distinct point in an appropriate explanation, **[3 max]**;*
push and pull are present in most innovations;
the concept for the design is likely to have been tested through market research;
miniaturization of technology is likely to have enabled the design realization; ***[3 max]***

F2. *Award **[1]** for identifying an appropriate benefit and **[1]** for a brief explanation, **[2 max]**;*
first in market with a new product;
no competition / potential for largest gains / profits; ***[2 max]***

F3. *Award **[1]** for a distinct point and **[1]** for a brief explanation, **[2 max]**;*
reduced consumption of virgin natural resources;
through increased use of recycled materials; ***[2 max]***

F4. *Award **[1]** per distinct point up to **[3 max]** per way for each of three ways **[9 max total]**.*
global marketplace includes lots of countries with different legal requirements that must be complied with;
market research will establish legislative requirements of products in different markets;
products can then be designed in response to requirements;

global marketplace includes lots of different cultures;
western culture often dominates global consumerism and does not reflect other cultures;
the product may need to be customized to meet particular local needs;
e.g. in the internal layout of the sections of the refrigerator-computer as a result of different food habits in different parts of the world;

there may be parts of the world in which the product would not fit in for cultural reasons and therefore would not be a viable market;
market research would establish if a product were a "non-starter" in a particular market;
It would establish viable and non-viable markets;

products must represent value for money to the consumer;
if a product were too expensive it would not be seen as value for money;
thus it would not be competitive throughout the global marketplace; ***[9 max total]***

Option G – Health by Design

G1. (a) *Award **[1]** for a definition to the effect of:*
Long-sightedness caused by the lens of the eye bringing rays to a focus behind the retina; ***[1 max]***

(b) *Award **[1]** for showing that the image is focused behind the retina, **[1 max]**.* ***[1 max]***

(c) *Award **[1]** for each distinct point in a brief description **[2 max]**.*
use of a convex lens;
converges light so that the image is focused on the retina; ***[2 max]***

(d) *Award **[1]** for each distinct correct point in an appropriate explanation, **[3 max]**;*
lenses can be thinner;
thus spectacles using high refractive index glass weigh less;
they are therefore more comfortable to wear;
the spectacles will look better; ***[3 max]***

G2. *Award **[1]** for each correct response from the list below, **[2 max]**;*
metals;
polymers;
ceramics;
glasses; ***[2 max]***

G3. *Award **[1]** for identifying a situation in which a designer would benefit from adopting a user-centred design and **[1]** for a brief explanation, **[2 max]**.*
scenarios which the designer may not appreciate as s/he have not experienced them, *e.g.* in relation to dealing with disability/particular lifestyles;
so the designer uses users as a resource to enhance his/her understanding; ***[2 max]***

G4. *Award **[1]** per distinct point – **[3 max]** for why indoor air pollution is a critical environmental issue, **[3 max]** for the role of clean fuels and **[3 max]** for the role of improved stove design in reducing indoor air pollution, **[9 max total]**;*

why is indoor air pollution a critical environmental issue? ***[3 max]***

many people in developing countries rely on biomass fuels for cooking and heating and burn them on open fires inside houses resulting in indoor air pollution which particularly effects women and young children;
air pollution in some homes can be higher than in the world's most congested cities;
indoor air pollution weakens the body's defences resulting in a range of serious diseases (*e.g.* respiratory infections, lung cancer, asthma, low birth weight and heart disease);

the role of clean fuels in reducing indoor air pollution? ***[3 max]***

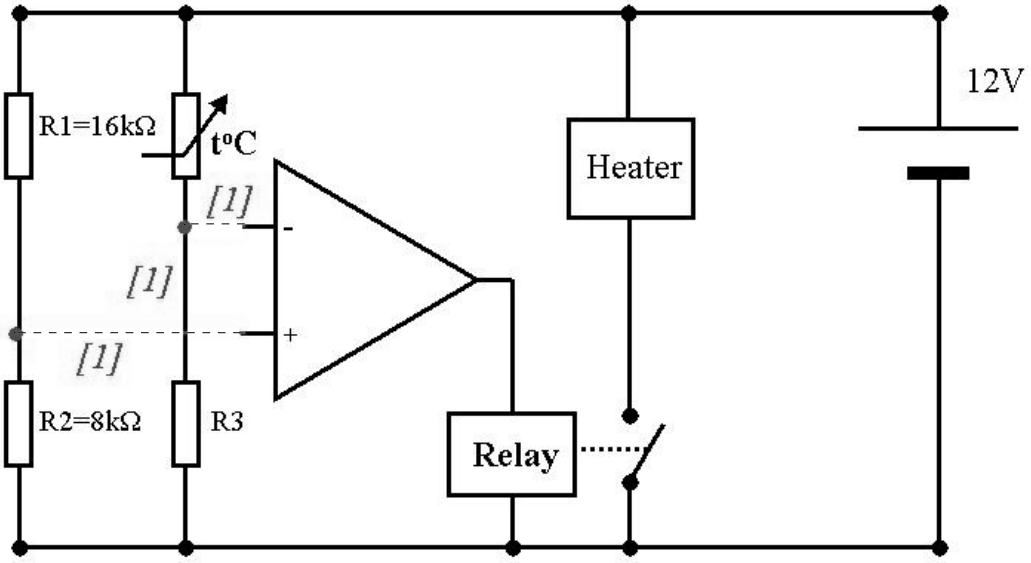
cleaner fuels burn to produce less smoke;
and less carcinogenic material;
this results in lower air pollution;

the role of improved stove design in reducing indoor air pollution? ***[3 max]***

improved stove designer can ensure that the fuel is burned at a higher temperature resulting in more complete combustion;
this results in lower amounts of carcinogenic and other materials being produced;
better stove design would also attend to enhanced ventilation so that the smoke is vented outside and women/children do not breathe in the fumes; ***[9 max total]***

Option H – Electronic Products

H1. (a)



thermistor and R3 in appropriate arrangement;
connection from thermisor/R3 to –ve terminal of op-amp;
connection of R1/R2 to +ve terminal of op-amp; ***[3 max]***

(b) the thermistor will have a resistance of 10 kW at 25°C ;
if R3 is 5 kW then when the resistance of the thermistor drops to 10 kW the heater will switch on; ***[2 max]***

(c) it will be possible to adjust the temperature at which the heater turns on and off;
by adjusting the variable resistor; ***[2 max]***

H2. *Award **[1]** for brief explanation, **[2 max]**;*
silicon;
germanium; ***[2 max]***

H3. *Award **[1]** for each distinct relevant point **[2 max]**.*
Unless the system is critically damped it will overshoot and oscillate around the ideal;
This will make the heater turn on and off unnecessarily; ***[2 max]***

H4. *Award **[1]** for each distinct point in an explanation of the benefits of using standards in the development of mobile phones **[9 max total]**.*

mobile phones need a complex and extensive infrastructure of transmitters across vast areas, *e.g.* countries to be of any use;
if mobile phones did not use standards then they could not share the transmitters;
this would impact on cost for users and extend lag period in implementation and the development of pan-national networks;
it would also mean that there would be more transmitters and there are already health concerns about the ones already erected;
using standards means that pioneering R&D can become more cost-effective;
R&D can be developed on a modular basis;
if a company develops and patents a particular standard component of the phone then this can become a product which can be marketed to other mobile phone manufacturers;
thus manufacturers can benefit from pioneering strategies in mobile phone technology (*e.g.* as has been done by Nokia);
companies with imitative strategies can benefit by not having to "reinvent the wheel";
standards ensure that there is plenty of competition amongst manufacturers and keeps costs down for consumers; ***[9 max total]***