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M04/470/H(3)M

MARKSCHEME

May 2004

DESIGN TECHNOLOGY

Higher Level

Paper 3

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.**

You should contact the TL whose name appears on your 'Allocation of Schools listing' sheet.

Note:
Please use a personal courier service when sending sample materials to TLs unless postal services can be guaranteed. Record the costs on your examiner claim form.

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. Indeed, another examiner may have arrived at the opposite decision. 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. Do **not** circle subtotals. Circle the total mark for the question in the right-hand margin opposite the last line of the answer.

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

7. For each Option: Add together the totals for each question in the Option and write it in the 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.

8. After entering the marks on the cover sheet check your addition of all marks to ensure that you have not made an arithmetical 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 all examiners.**

9. 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.

10. If a candidate has attempted more than the required number of Options within the paper, mark only the required number of Options in the order in which they are presented in the paper and ignore any excess material, regardless of its quality. Make a comment to this effect in the left hand margin.

11. 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 organoleptic properties of food **[2 max]**.*
taste / flavour;
smell;
appearance;
texture;
sound; ***[2 max]***

(b) *Award **[1]** per distinct point in an appropriate explanation.*
the taste panel is made up of people from the same market segment as target market, *e.g.* child or adult markets;
samples are compared, often in pairs by taste panel;
the preferred sample is compared with another;
this continues until the product is considered satisfactory by the taste panel; ***[3 max]***

D2. *Award **[1]** mark for a reason for a way in which freezing extends the safe shelf life of ice cream and **[1]** for a brief explanation **[2 max]**.*
freezing prevents microbial growth; but it does not kill microorganisms;
freezing reduces the water activity; so water is unavailable for microbial growth; ***[2 max]***

D3. *Award **[1]** mark per distinct point **[2 max]**.*
increased volume but mass unchanged;
therefore density reduced; ***[2 max]***

D4. *Award **[1]** for each of two appropriate ways that food packaging is used as a promotional tool **[2 max]**.*
graphic design of package (font, presentation, logo, *etc.*);
makes the brand easily recognizable;
promotes other products in the range;
provides serving suggestion for product;
makes the product look highly desirable;
packaging can give indication of quality;
packaging is designed specifically for a particular target market;
Information e.g. ingredients or recyclability of materials which appeals to different consumer groups. ***[2 max]***

D5. *Award **[1]** for a way that food poisoning can be avoided plus **[1]** for each distinct point in an explanation up to **[2]**; **[3 max]** per way; **[9 max]** total;*

Good personal hygiene;
handwashing after using the toilet;
removes gut bacteria from hands;
reduces likelihood of contaminating food with food poisoning bacteria;

Good design of food preparation areas;
non-porous surfaces, *e.g.* stainless steel, can be easily cleaned;
cleaning surfaces before preparing foods;
ensures that food poisoning bacteria are not transferred from surfaces and equipment to the food;

Preventing the growth of food poisoning bacteria in food;
foods kept warm/in the temperature danger zone will allow the growth of food poisoning bacteria;
ensure high risk foods are kept cold (below 10°C) or hot (above 63°C);

Proper cooking of food;
sufficiently high cooking temperature;
sufficient cooking time to allow heat to permeate through the food; ***[9 max]***

Option E – Computer aided design, manufacture and production

E1. (a) *Award **[1]** for a definition to the effect of*
a sophisticated computerized volume production system responsive to individual customer orders. ***[1 max]***

(b) *Award **[1]** for input device.*
mouse / trackerball;
keyboard; ***[1 max]***

(c) *Award **[1]** per distinct relevant point within a brief explanation.*
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; ***[2 max]***

E2. *Award **[1]** per distinct point.*
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 and have a stable workforce;
less capital costs than JIT ;
able to stock pile supplies or finished products; ***[3 max]***

E3. *Award **[1]** for each one of two appropriate computer modelling techniques **[2 max]**.*
e.g. spreadsheet;
animation;
virtual reality;
architectural software;
engineering software;
solid modeling;
surface modeling;
simulation;
rapid prototyping; ***[2 max]***

E4. *Award **[1]** for each distinct appropriate strategy for design for disassembly **[2 max]**.*
e.g. minimizing the number of parts;
designing components made from one material;
using adhesives that lose their properties when heated;
using snap fittings rather than gluing and welding;
design release points for snap fittings; ***[2 max]***

E5. *Award **[1]** per distinct point up to **[3 max]** per way for each of three ways **[9 max]** total.*

Designers can use websites and email to share designs with other designers;
the website would be password protected;
expertise can be shared between designers in a team;
team can be based globally;
need for international travel can be reduced;
different parts of a design can be developed in parallel using appropriate expertise;
Designers can use the Internet to receive comments from potential users;
market research can be undertaken using the Internet;
animation/virtual reality can be used to explain the design to users;

Designers can use Internet to share designs with manufacturers;
manufacturers can comment on the design as it develops;
design for manufacture/lean production;

Designers can use the Internet to obtain information;
on materials;
manufacturing techniques;
on sources of components;
expert appraisal ***[9 max]***

Option F – Invention, innovation and design

F1. (a) *Award **[1]** for each distinct point.*
the bagless vacuum cleaner was a new product/radical design/is not based on traditional products;
it incorporates new technology/new materials in the design;
radical in aesthetics i.e. colour; transparent cylinder or style ***[2 max]***

(b) *Award **[2 max]** for an appropriate outline one mark for reference to an incremental feature; one mark for reference to a radical feature.*
many aspects of the design are the same or similar to what went before, *e.g.* the cyclone, the wheels, *etc*. and thus the design is partially incremental;
difference is hidden technology relating to the computerization of the robot and thus the design is partially radical; ***[2 max]***

(c) *Award **[2 max]** for an appropriate outline.*
investment in a radical design is risky;
many people like to wait to see if an idea will be successful before investing in it;
investors cannot see the potential for success (share the vision).
penetrating existing markets is difficult ***[2 max]***

F2. *Award **[1]** for identifying the strategy of the Dyson company and **[1]** mark per distinct point in an explanation **[3 max]**.*
first in market with a new product;
most risky strategy;
potential for largest gains/profits;
gain brand identity;
expensive to market ***[3 max]***

F3. *Award **[1]*** for a distinct point and ***[1]*** for a brief outline ***[2 max]***.
marketability/need; there may not be a market for the idea;

the product may not be marketed properly; Too little money may be invested in marketing;

OR

the product may not be appropriately targeted to a market segment;

the product may be priced too high; so that the product does not represent good value for money for customers; ***[2 max]***

F4. *Award **[1]** per distinct point up to **[3 max]** per way for each of three ways **[9 max]** total.*

Global consumerism can destabilize local economies;
major impacts on local economies and cause redistribution of money;
leakage of monies from local economies can destabilize local communities;
puts some people out of work and provides work for others;

Global consumerism using Internet can cause breakdown of local shopping centres and town centres;
local suppliers may not be able to access global products and thus go out of business;
shopping via Internet bypasses local suppliers;
people may no longer use local markets, which are important parts of communities and local traditions;
it changes lifestyles – more choice for lower prices;

Global consumerism does not respect local cultural values;
western culture, dress codes and foods (*e.g.* McDonalds) often dominate global consumerism;
local traditional dress codes and food habits will be eroded;
children and teenagers are particularly affected by global consumerism;
it raises expectation; ***[9 max]***

Option G – Health by design

G1. (a) *Award **[1]** per distinct point for appropriate explanation.*
at lower frequencies the person's hearing is normal and he/she would be able to hear people talking;
at higher frequencies the person would be unable to hear consonants and would find it difficult to distinguish some words from others; ***[2 max]***

(b) *Award **[1]** for an appropriate disadvantage plus **[1]** for brief explanation.*
a digital hearing aid can divide incoming sound into distinct bands which are individually selected for amplification;
thus the amplification can be tailored to an individual's hearing loss;
in this case frequencies from 2 000 – 8 000 Hertz could be amplified and sounds below 2 000 Hertz not amplified; ***[3 max]***

G2. *Award **[1]** for each distinct point in a description of a catalytic converter **[2 max]**;*
toxic carbon monoxide and incompletely combusted hydrocarbons are oxidized to carbon dioxide and water;
toxic nitrogen oxides are reduced to nitrogen; ***[2 max]***

G3. *Award **[2]** for each distinct point in an appropriate description of an advantage of one-day disposable contact lenses **[2 max]**.*
no cleaning required;
fits in better with active lifestyles;
reduces need for cleaning chemicals;
easier for traveling; ***[2 max]***

G4. *Award **[1]** for an advantage of user-centred design and **[1]** for a brief explanation;*
the designer may be designing for disabled people but not be disabled;
s/he may not fully understand the implications of the disability and will learn from discussions with people suffering the particular disability;
the designer may be designing a product for in a particular sport in which s/he is a non-participant;
participants in the sport will inform the design to ensure it meets its target need; ***[2 max]***

G5. *Award **[1]** for each distinct reason identified and **[1]** mark per distinct point in an explanation **[3 max]** per reason, **[9 max total].***

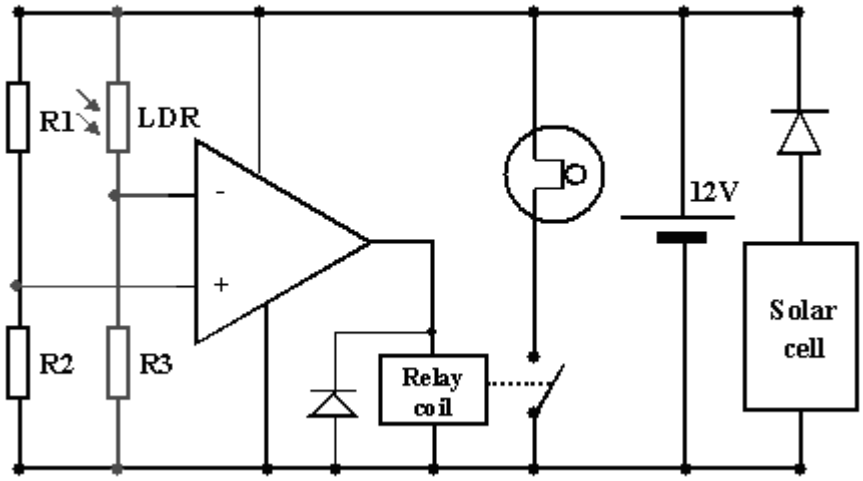
Enhanced productivity;
matching physical requirements of a job with the physical capacity of the human body can make employees work more efficiently and effectively;
e.g. provision of appropriate equipment, *e.g.* lifting equipment or an appropriate chair for operating a computer can minimize the likelihood of RSI;

Reduction in sickness leave;
RSI results in days off sick;
Leading to lost productivity;
and reduced profits;

Reduction in staff turnover;
RSI can increase staff turnover;
High staff turnover results in more money being spent of recruitment and selection of staff;
New staff have to be trained which costs money; ***[9 max]***

Option H – Electronic products

H1. (a)



LDR and R3 in appropriate arrangement;
Connection from LDR/R3 to – terminal of op-amp;
Connection of R1/R2 to + terminal of op-amp; ***[3 max]***

(b) The LDR will have a resistance of 12 kW at dusk;
If R3 is 6 kW then when the LDR resistance reaches 12V the light will switch on; ***[2 max]***

(c) Addition of a feedback resistor taking the output signal from the op-amp;
and feeding it back into the inverting input; ***[2 max]***

H2. *Award **[2 max]** for brief explanation.*
Use of timer as one input to **OR** gate and output from op-amp as second input to **OR** gate;

If time is 2100 **OR** it is dusk then light will come on; ***[2 max]***

H3. *Award **[1]** for each distinct relevant point **[2 max]**.*
wastage of raw materials is reduced;
PICs are cheap and accessible;
PICs enable the miniatuarisation of circuitry so that a prototype of the solar powered light could be produced can be produced;
programme can be modified for PIC to perform different functions;
the same device can be used for many functions;
easy to set to any light level and at any time; ***[2 max]***

H4. *Award **[1]** for each distinct point in an explanation **[3 max]** per way of multiplexing **[9 max]** total.*

frequency division multiplexing (FDM);
each signal is assigned a different frequency or sub-channel within the main channel;
depending on the bandwidth of the individual signal and the bandwidth of the cable the number of signals that can be simultaneous transmitted can be calculated;

time division multiplexing (TDM);
the signal is divided into segments each with a very short duration;
each individual segment is reassembled at the receiving end based on the timing;

dense wavelength division multiplexing (DWDM);
combines multiple signals simultaneously in an optical fibre using separate wavelengths;
can carry different types of traffic at different speeds over an optical channel;

[9 max]