

MARKSCHEME

May 2005

DESIGN TECHNOLOGY

Higher Level

Paper 3

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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 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 penalise 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 distinct point in a description of a balanced diet [2 max].*

adequate amounts of energy;
optimum amount of protein;
adequate essential fatty acids;
adequate vitamins;
sufficient dietary fibre;
optimum amounts of starch and fat (*i.e.* not in excess);
balance from each food group (maybe represented by a pyramid);
requirements vary for different age groups;

[2 max]

(b) *Award [1] for identifying a health issue and [1] for a brief explanation of its implications for food choice, [2 max].*

coronary artery disease/heart problems;
 select foods with lower saturated fat content to reduce fat intake;
diverticular disease or other gastro-intestinal problems;
 select higher fibre content foods;
obesity/overweight;
 select diet with lower energy content – low fat, low sugar, high fibre;
diabetes;
 carefully control carbohydrate intake;

allergies;
 choose foods known not to effect the allergy;

[2 max]

(c) *Award [1] for each distinct point in an evaluation of the accessibility of information in Table D1 and Figure D1 [3 max].*

the pictogram is easy to read and understand;
the Table D1 requires a higher level of understanding;
information is on the can label so it is easily accessible;

[3 max]

D2. *Award [1] for each distinct point in a description of how canning tomatoes enhances their monetary value [2 max].*

secondary processing – cleaning, cooking and canning – all add value to the tomatoes;
soup therefore has a higher monetary value than tomatoes;

[2 max]

D3. *Award [1] for identifying one way that the packaging of food contributes to the development of brands and [1] for a brief explanation, [2 max].*

colour and style of packaging;

 makes the brand easily recognizable to the potential consumer;

use of company logo on packaging;

 makes the brand memorable to the potential consumer;

diet and nutrition information;

 increases confidence in the brand;

[2 max]

D4. *Award [1] for each distinct reason why consumption of the tomato soup is unlikely to result in food poisoning and [1] for each distinct point of explanation, [3 max] per reason, [9 max].*

Packaging;

 packaging is sealed;

 sterile;

 hygiene protocols are followed;

 packaging is automatic with no human intervention;

 done at very high temperatures;

 tomato soup is sterile until opened;

Storage;

 can be stored at a range of temperatures;

 can be stored in a range of conditions;

 product sealed while in storage;

Instructions;

 instructions for preparation given on the label;

 following instructions will minimize food poisoning;

 likely to be opened and heated for immediate consumption;

Manufacture;

 quality control standards would be followed;

 company would follow food manufacturing protocols;

[9 max]

Option E — Computer aided design, manufacturing and production

E1. (a) *Award [1] for outlining one impact of Rule #4 on the workforce and [1] for a brief explanation [2 max].*

- workers would learn on the job;
 - this would promote their self-esteem;
- workers would develop their understanding of scientific method;
 - they would formulate hypotheses and test them and be able to document them and so learn more effectively;
- workers are continuously thinking how they can improve their work;
 - they therefore have greater ownership of the quality of the finished product;
- increased job satisfaction;
 - feel more important and responsible;
- contribution to the company would increase;
 - development of new techniques;

[2 max]

(b) *Award [1] for each distinct point in an explanation of how Rule #2 helps to reduce water and conserve resources [3 max].*

- material would be supplied in response to need;
- only parts which were going to be used would be ordered;
- reduces stockpiling of parts wasted warehouse space;
- ease of tracking supplies to know if anything is missing;

[3 max]

(c) *Award [1] for identifying one way in which Rule #1 contributes to the quality of the finished car and [1] for a brief explanation [2 max].*

- more consistency in production;
 - specific standards maintained;
 - there is no such thing as a Saturday car or equivalent sub-standard product;
- defect control;
 - defects can be tracked down and corrected;
 - enhanced product quality;
 - consistently high quality;

[2 max]

E2. (a) *Award [1] for each distinct point in a description of mass customization transforms the relationship between a car manufacturer and the consumer [2 max].*

- the relationship is a direct one;
- not mediated via a third party;
- customers interacts directly the manufacturing system;

[2 max]

- (b) *Award [1] for identifying one way in which virtual reality helps a car manufacturer to communicate with consumers to implement mass customization and [1] for a brief explanation, [2 max].*

VR can present images to customer;
enhances communication;
consumers can see the finished product with their choices included;
consumers can see the different purchasing options (model, colour, accessories);
customer likely to be more content with their choice after purchase;

[2 max]

- E3.** *Award [1] for each distinct reason why global manufacturers from the West have found it hard to adapt to lean production and [1] for each distinct point of explanation, [3 max] per reason, [9 max].*

requires a different philosophy of working;
some manufacturers have taken some of the elements of lean manufacture but have not embraced the whole philosophy;
they have thus found it did not deliver all that it promised;

traditional working practices are often difficult to change;
due to heavily unionized workplaces;
lean manufacture cannot be introduced incrementally so sudden change is significant;

traditional workplaces are organized functionally;
lean manufacturing workplaces are laid out in work cells to reflect the product flow;
requires a total reorganization of the factory layout;

workers have to respond to customer orders;
must shift from one product to another in response to the order;
this requires short changeover times for tooling;

pressure on the workforce;
workforce needs to be multi-skilled;
pressure to minimize defects;

costs;
expensive to change;
flexible automated machinery is expensive;

[9 max]

Option F — Invention, innovation and design

F1. (a) *Award [1] for identifying a reason why mobile phones are unlikely to be developed by a lone inventor and [1] for a brief explanation [2 max].*

- mobile phones are complex products;
- they incorporate knowledge from different discipline areas;
- mobile phones are expensive to produce;
- the requisite investment would be too much for one individual;

[2 max]

(b) *Award [1] for each distinct point in a comparison of a lone inventor and a product champion [2 max].*

- lone inventors:
- generally lack the business acumen;
 - are not forceful enough;
 - are not team players / work on their own;
 - spend many years on development;

- Product champions:
- good at taking ideas to the marketplace;
 - considerable influence in a company;
 - work in a group;
 - are business minded;
 - promote eagerly;

[2 max]

F2. *Award [1] for identifying a lifestyle factor that has promoted the diffusion of the mobile phone into the marketplace and [1] for a brief explanation [2 max].*

- increased mobility;
 - people are traveling and want to keep in touch;
- security;
 - increase in crime and mobile phones make people feel they can call for help if required;
- more disposable income;
 - money to spend on a phone;
- fashion;
 - must have the latest phone;
 - status symbol;
- convenience;
 - keep in contact anywhere;
 - use time more efficiently;

- family structures;
 - both parents working, need to keep in touch;

[2 max]

F3. *Award [1] for each distinct point in an explanation of how people can be classified according to their reaction to technological change [3 max].*

technophobe;
fear of new technology and avoid it;

techno cautious;
may be encouraged to use new technology;

technophile;
love and adopt new technology;

[3 max]

F4. *Award [1] for identifying one reason why there is often resistance to innovation by companies and [1] for a brief explanation, [2 max].*

research and development is expensive;
companies are often reluctant to invest in R&D and prefer to adopt an imitative corporate strategy;

a pioneering corporate strategy is risky;
many companies are risk-averse and so select an imitative corporate strategy;

innovation involves disturbance and change;
change is naturally resisted;

[2 max]

F5. *Award [1] for identifying each strategy for innovation [3 max] and [1] for each distinct point of explanation [2 max] per strategy, [9 max].*

market development;
opening up new markets by finding new applications for existing products;
changing the product specification (e.g. colour, complexity, cost);
responding to the characteristics and tastes of the new market;

product development;
involves the development of a product to meet the needs of the company's existing customers;
the modifications to the design must add value to the modified product and make it that the product will be replaced;
planned obsolescence of the existing product will force customers to replace their product with the modified product;

diversification;
focuses on the development of new products;
these could be for new or existing customers;

market penetration;
targeting advertising;
research into the development of existing markets;

[9 max]

Option G — Health by design

G1. (a) *Award [1] for identifying a lifestyle factor which leads to the popularity of extended wear lenses and [1] for a brief explanation, [2 max].*

people are traveling away from home more for business and leisure;
they do not want the hassle of carrying lens cleaning solutions and equipment or disposable lenses;

people lead busy, active lives;
they do not want to change lenses on a daily basis;

[2 max]

(b) *Award [1] for identifying the frequency of epithelial microcysts for high Dk lenses and [1] for identifying the frequency for low Dk lenses, [2 max].*

low Dk lenses have a higher frequency over time;
high Dk lenses have a lower frequency over time;
up to 40 days the pattern is not consistent;

[2 max]

(c) *Award [1] for each distinct point in a description of why silicone hydrogel would be approved specifically for use in contact lenses rather than in isolation [2 max].*

there is no absolute biocompatibility;
materials appropriate for one application may not be safe for another application;

[2 max]

G2. *Award [1] for identifying a design context in which user-centred design is particularly applicable and [1] for a brief explanation [2 max].*

disability;
if the designer does not fully understand that challenges faced by the disabled person then s/he cannot be fully confident that the design meets the needs of the disabled person;

lifestyle issues, e.g. participation in extreme sports;
if the designer does not participate in the particular extreme sport then s/he cannot be fully confident that the design meets the needs of the user;

[2 max]

G3. *Award [1] for each distinct point in an explanation of the benefits of being able to reuse hearing aid shells, [3 max].*

hearing aid shells are made to fit an individual's ear accurately;
the circuitry inside is not custom-made;
as circuitry improves it can replace old circuitry in the same shell;
this save time and money;
reuse enables energy and resources to be saved;

[3 max]

G4. Award **[1]** for each distinct benefit of an organization investing in preventing repetitive strain injury and **[1]** for each distinct point of explanation, **[3 max]** per benefit, **[9 max]**.

enhanced productivity;

RSI reduces employee performance and hence productivity;

it is cheaper for an organization to invest in preventing RSI, e.g. ergonomically designed workstations than the cost of reduced productivity;

reduction in sickness leave;

RSE can result in people taking more time off work;

employer will have to pay sick pay but will be getting no return on the money;

reduction in staff turnover;

people to consider leaving a job that causes them RSI;

labour turnover cost the employer money as s/he will have to recruit and train new staff as well as having reduced productivity during the absence of a member of staff;

legislation;

conform to legislative requirements;

avoid legislation penalties;

employees may sue the company;

[9 max]

Option H — Electronic products

H1. (a) *Award [1] for each appropriate input signal from the following [2 max].*

desired speed;
actual speed;

[2 max]

(b) *Award [1] for identifying an appropriate gate and [1] for a brief explanation, [2 max].*

OR

to achieve the truth table requires a NOR gate so an **OR** and a NOT combine to make the NOR;

[2 max]

(c) *Award [1] for each distinct point in description of how a comparator would be used in the cruise control system [2 max].*

the comparator would compare a signal relating to the speed of the car with a reference signal relating to the desired speed;
this would generate an error signal which would be used to adjust the throttle pedal;

[2 max]

H2. *Award [1] for each distinct point in an explanation of why negative feedback not positive feedback is used in the cruise control system [3 max].*

positive feedback would accentuate any differences in speed and would move the speed still further away from the desired speed;
negative feedback would reduce the error signal;
the effect of negative feedback would be to stabilize the system;

[3 max]

H3. *Award [1] for each distinct point in a description of why a microprocessor would be used in the implementation of the cruise control system, [2 max].*

a microprocessor is a multi-purpose programmable integrated circuit capable of a wide range of functions;
it would be used to programme the various elements of the cruise control system circuit rather than hardwiring it from separate components;

[2 max]

H4. *Award [1] for each distinct function that could be programmed onto a multifunction smart card to benefit a car owner [3 max] per function, [9 max].*

Security;

the smart card could be programmed to identify permitted vehicle users with unauthorized drivers being unable to start the car;
the card could be programmed to enable access (or not) to specific zones, e.g. car parking areas;

Speed limits;

different drivers could have different maximum speeds;
inexperienced drivers might be allowed lower maxima;

Cash card for buying fuel;

the card could be used as an electronic wallet/credit/debit card;
this would reduce the number of separate cards that the driver would have to carry;

Tachometer functions could be programmed onto the card;

this would allow the card to monitor driving times and distances;
this could contribute to driver safety;

[9 max]
