

MARKSCHEME

May 2002

DESIGN TECHNOLOGY

Standard Level

Paper 3

Subject Details: Design Technology SL Paper 3 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in each of **THREE** Options (total 15 marks). Maximum total = 45 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 A – Raw material to final product

- A1.** (a) limestone *[1]*;
coke *[1]*; *[1 max]*
- (b) less brittle *[1]*;
higher tensile strength *[1]*; *[2 max]*
- (c) addition of Cr (18 %) and Ni (8 %) produces stainless steel *[1]*;
good corrosion resistance *[1]*;
no need for finishing through addition of plastic or paint *[1]*;
named application – cutlery *[1]*; *[3 max]*
- A2.** *[1]* for each distinct correct point up to *[2 max]*.
toughened glass shatters into tiny fragments when broken *[1]*;
laminated glass stays together on impact and cracks do not grow *[1]*; *[2 max]*
- A3.** (a) *[1]* for appropriate definition.
the process of drying out timber after conversion
- (b) the timber is likely to crack and twist as it dries *[1]*;
resulting in a defect in the product *[1]*; *[2 max]*
- A4.** *[1]* for each distinct correct point up to *[4 max]*.
food products must have a market to be successful *[1]*;
the first look and smell of the product is important *[1]*;
people often compare new food products with familiar food products *[1]*;
introducing mycoprotein in a familiar product will enhance its chances of success *[1]*;
once mycoprotein is accepted it can be introduced into new (unfamiliar) foods *[1]*;
OR as an ingredient in its own right *[1]*;
people suspicious of new products *[1]*;
very difficult to get people to try new product *[1]*;

Option B – Products in context

- B1.** (a) a resource is the quantity of material that is actually OR potentially available for human use; **[1 max]**
- (b) if market demand for a reserve is high it will drive up the price **[1]**;
higher prices mean that the resource is more likely to be exploited **[1]**; **[2 max]**
- (c) recycling can be expensive **[1]**;
and its costs need to be balanced against the cost of non-recycled (virgin) materials **[1]**;
if the cost of virgin materials is low **[1]**;
and the cost of recycling is high **[1]**;
then materials are unlikely to be recycled (and vice versa) **[1]**; **[3 max]**
- B2.** **[1] for each correct distinct point [2 max].**
a safety test will focus solely on technical features (lights, steering, brakes, suspension, tyres etc.) **[1]**;
other issues (e.g. price, running costs, comfort, handling, appearance, environmental issues) will not be considered) **[1]**; **[2 max]**
- B3.** (a) **[1] for appropriate definition.**
the use of consumer reports, newspaper items, CD-ROMs, the World Wide Web, etc.
to collect information about elements of a design.
- (b) full details of the criteria used to evaluate the product may not be known **[1]**;
thus the data may not be comparable **[1]**; **[2 max]**
- B4.** **[1] for identifying an appropriate issue and [1] for outlining the issue. Up to [2] for each distinct issue [4 max].**
renewable versus non-renewable resources versus economic considerations;
using non-renewable resources may be cheaper than considering renewable alternatives, e.g. energy;
planned obsolescence versus longevity;
planned obsolescence enables a product to be redesigned to meet evolving safety standards but shortens the product life whereas longevity will help to conserve resources;
aesthetics versus function;
explanation;
consideration of culture, values and attitudes;
explanation; **[4 max]**

Option C – Mechatronics

C1. (a) velocity ratio = number of teeth on driven gear / number of teeth on driver gear,
 $\frac{30}{6} = 5$; [2 max]

(b) [1] for appropriate calculation [1] for correct answer including units.

$$\frac{180\,000}{10 \times 60} = 300 \text{ Js}^{-1} \text{ OR watts}; \quad [2 \text{ max}]$$

(c) Up to [2 max]. [1] for showing how calculation is done and [1] for right answer.

$$\frac{180\,000}{750} [1] = (240 \text{ seconds}) = 4 \text{ minutes } [1];$$

$$\text{or } \frac{300}{750} \times 10 [1] = 4 \text{ minutes } [1]; \quad [2 \text{ max}]$$

C2. [1] for appropriate diagram and [1] for correct labelling, up to [2 max].

the moment is the measure of the torque produced by a force about an axis and equals force × distance from the axis. When a lever is in equilibrium the product of (force × distance) on one side of the fulcrum equals the (force × distance) on the other [1] and so the net moment is zero [1]; [2 max]

C3. (a) [1] for appropriate definition
 a simple electromechanical system for control involving two states on and off [1 max]

(b) [1] for appropriate example and [1] for a brief explanation, up to [2 max].
 stepper motor (e.g. in a dot matrix printer) or railway signals or thermostatically controlled devices, e.g. oven, security lights;
 reference signal carries desired position information and feedback signal indicated actual position. A comparator compares reference and feedback signal to generate error signal which is used to drive the motor; [2 max]

C4.

INPUT Signal from satellite

[1]

PROCESS comparator

[1]

OUTPUT Servo motor moves satellite dish
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[1]

feedback from motor to comparator; [1]
[4 max]

Option D – Food technology

- D1.** (a) twister;
mini milk;
mini juice;
calippo;
vanilla tubs; **[1 max]**
- (b) tasting panel would be selected to match characteristics of target market **[1]**;
taste panels are used for holistic checking of food products **[1]**;
and to refine the specification **[1]**;
e.g. in relation to size, colour, texture, smell, packaging considerations **[1]**; **[2 max]**
- (c) although some budget / own label products intentionally mimic mainstream products **[1]**;
generally a new food product is trying to be distinctively different **[1]**;
comparison enables manufacturer / designer to be able to predict a likely market for
the product **[1]**; **[3 max]**
- D2.** **[1]** for appropriate factor, **[1]** for appropriate explanation, up to **[2 max]**.
water content **[1]** concentrating fruit juice before transportation reduces transport costs **[1]**;
shelf life considerations **[1]** primary processing results in better storage properties **[1]**; **[2 max]**
- D3.** (a) **[1]** for appropriate definition.
the exposure of a protein to heat OR acid which results in irreversible changes which
reduce solubility and change optical characteristics; **[1 max]**
- (b) coagulation of protein in the baking of bread fixes the final stable structure of the
aerated dough **[1]**;
the gluten which was previously elastic becomes inelastic and thus cannot return to
its original shape **[1]**; **[2 max]**
- D4.** **[1]** for each distinct correct point up to **[4 max]**.
health consciousness had raised awareness of health issues **[1]**;
associated with certain dietary patterns **[1]**;
e.g. high fat intake is associated with heart disease **[1]**;
this has spawned a range of lower fat alternatives or “light” products **[1]**;
also has modified farming practices **[1]**;
e.g. lower fat meats with different red / white ratio **[1]**;
also butchery practices **[1]**;
e.g. extra-trimmed products **[1]**;
with fat physically removed **[1]**; **[4 max]**

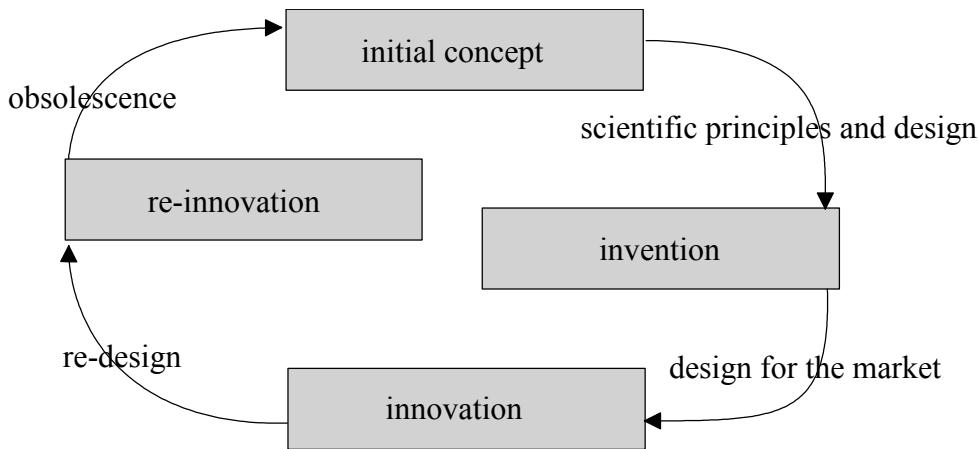
Option E – Computer aided design and manufacturing

- E1.** (a) *[1]* for any of the following, up to *[2 max]*.
scanner;
digital camera;
graphics tablet;
video camera;
- (b) *[1]* for each distinct relevant point plus explanation, up to *[2 max]*.
number of employees *[1]* and explanation *[1]*;
requisite skills *[1]* and explanation *[1]*;
training issues *[1]* and explanation *[1]*;
working environment (health and safety issues) *[1]* and explanation *[1]*; *[2 max]*
- (c) using virtual reality products can be marketed (shown to the public) *[1]*;
even though they have not actually been manufactured *[1]*;
this clearly results in savings of time, materials, energy *[1]*;
if product doesn't sell then no need to produce it *[1]*; *[3 max]*
- E2.** *[1]* for appropriate disadvantage plus *[1]* for explanation, up to *[2 max]*.
interior design packages model before implementation e.g. kitchen design in retailer showrooms;
can input model and colour for cars and see them virtually before decision passed to production line;
thus better match of production to demand; *[2 max]*
- E3.** (a) *[1 max]* for appropriate definition.
an agreement from a government office giving someone the right to make or sell a new; invention for a certain number or years; *[1 max]*
- (b) designs can be very easily copied *[1]*;
and just changed marginally *[1]*;
this would mean that the person would overcome patent / copyright issues *[1]*; *[2 max]*
- E4.** *[1]* for each distinct correct point up to *[2 max]* for advantages, *[2 max]* for disadvantages, *[4 max]* for question.
- advantages**
- more consistent quality, better quality control;
 - parts easily manufactures and changed;
 - better machine utilisation;
 - improvements in productivity;
- disadvantages**
- high set up costs – capital;
 - job losses;
 - training issues;
- [4 max]*

Option F – Invention, innovation and design

- F1.** (a) the business of putting an invention in the market place and making it a success; **[1 max]**
- (b) technological push: the impetus for a new design emanates from a technological development;
 market pull: the initial impetus for the development of a new product is generated by a demand from the market; **[2 max]**
- (c) *Award [1] per distinct point up to [3 max].*
- this product is designed in response to the market for gadgets combining designer sportswear and digital technology;
 - the technological push for this product stems from the development of MP3 technology and proliferation of Internet sites featuring downloadable music;
 - it is difficult to determine absolutely whether market pull OR technological push is the impetus for the design of new products; **[3 max]**

- F2.** *Award [2] for complete and correct diagram / labels.*
Award [1] for incomplete but correct diagram / labels.
Award [0] for incomplete and incorrect diagram.



[2 max]

- F3.** (a) the process of discovering a principle, a technical advance in a particular field often resulting in a novel product; **[1 max]**
- (b) designers use inventions to develop designs **[1]**;
 by making further modifications / developments depending on market needs and available resources **[1]**; **[2 max]**

- F4.** **[2]** for each distinct correct demand plus features, up to **[4 max]**.
 lifestyle issues – busy people, e.g. working women, require fast efficient ovens;
 timers, fan-assisted ovens, self-cleaning ovens;
 environmental considerations;
 demand for more energy efficient and less air polluting ovens; **[4 max]**

Option G – Health by design

- G1.** (a) more reliable [1];
cheaper [1];
reduces contamination [1];
are more quantitative [1]; [1 max]
- (b) when immersed in urine containing glucose the enzymes are activated [1];
and react with the glucose causing a colour change in the dye [1]; [2 max]
- (c) [1] per distinct point, up to [3 max].
diabetics are able to regulate their own glucose intake [1];
and thus continuous monitoring by doctors is not necessary [1];
this enables considerable freedom for the individual [1];
and also more effective monitoring and treatment [1]; [3 max]
- G2.** [1] for correct advantage, [1] for explanation, up to [2 max].
do not need to be cleaned [1] therefore fit in better with busy lifestyles [1];
do not need cleaning fluids [1] therefore reduced environmental impact [1];
do not need cleaning fluids [1] therefore lighter and less bulky when travelling [1]; [2 max]
- G3.** (a) [1] for appropriate diagram, [1] for correct labelling of mercury scale. [2 max]
- (b) [1] for a correct disadvantage, [1 max].
easily broken, e.g. in a child's mouth [1];
OR needs to be sterilised between users [1];
OR not quick to take temperature (30 s / 1 m) [1]; [1 max]
- G4.** [2] for each distinct correct point and explanation up to [4 max].
no x-rays [1] therefore hazards of x-rays are removed [1];
non-invasive technique [1] therefore diagnosis can be done without surgical complications [1];
better resolution images [1];
therefore more diagnostic [1]; [4 max]
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