



MARKSCHEME

May 2014

DESIGN TECHNOLOGY

Standard Level

Paper 2

11 pages

*This markscheme is **confidential** and for the exclusive use of examiners in this examination session.*

*It is the property of the International Baccalaureate and must **not** be reproduced or distributed to any other person without the authorization of the IB Assessment Centre.*

Subject Details: Design Technology SL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in Section A (total 20 marks) **ONE** question in Section B [20 marks]. Maximum total = 40 marks.

1. A markscheme often has more marking points than the total allows. This is intentional.
2. Each marking point has a separate line and the end is shown by means of a semicolon (;).
3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.
4. Words in brackets () in the markscheme are not necessary to gain the mark.
5. Words that are underlined are essential for the mark.
6. The order of marking points does not have to be as in the markscheme, unless stated otherwise.
7. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity as that in the markscheme then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by **OWTTE** (or words to that effect).
8. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
9. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking indicate this by adding **ECF** (error carried forward) on the script.
10. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

SECTION A

1. (a) (i) *Award [1] for stating one reason why the Cheetah blade has been designed to absorb vertical shock.*
if the Cheetah blade did not absorb the shock it would be transmitted to the runners body/could cause injury/discomfort/reduced performance; [1]
- (ii) *Award [1] for stating one benefit of using carbon fibre composite for the Cheetah blade in relation to strength-to-weight ratio [1 max].*
carbon fibre is extremely strong but very lightweight/high strength to weight ratio;
the Cheetah blade only weighs 512 g but can be used by someone weighing up to 147 kg;
the Cheetah blade needs to be very lightweight in order for athletes to be able to perform well and must also be very strong/withstand high loads; [1 max]
- (iii) *Award [1] for reason why materials development for the Cheetah blade took so long even though carbon fibre is not a new material and [1] for a brief explanation [2 max].*
composite materials are designed for specific purposes;
obtaining the correct composition of the material for such a specific application would be a complex/time-consuming process;

development of new materials is costly;
the company needs to ensure that the necessary funds are in place to support on-going development; [2]
- (b) (i) *Award [1] for a reason for designing the Cheetah blade so that the toe shape can be customized and [1] for a brief explanation [2 max].*
the toe shape will affect balance/grip;
different shapes are required due to the variation in sizes of athletes/the way athletes run; [2]
- (ii) *Award [1] for a reason for designing the Cheetah blade so the tread plate can be customized and [1] for a brief explanation [2 max].*
athletes run on different surfaces in competitions;
attaching the correct tread plate for the running surface will optimise performance; [2]

- (c) (i) Award [1] for stating the manufacturing technique for the Cheetah blade.
moulding; [1]
- (ii) Award [1] for each of three distinct correct points in an explanation of why the Cheetah blade is manufactured in different thicknesses [3 max].
the thickness of the blade affects its stiffness;
optimum stiffness is required so that the Cheetah blade flexes enough to provide the energy;
different body weights of athletes will require different thicknesses of Cheetah blade in order to achieve the optimum performance; [3]
2. (a) Award [1] for stating the percentile that would be used to decide the maximum height for a supermarket shelf.
50th (adult); [1]
- (b) Award [1] for each of three distinct correct points in an explanation of why percentile ranges for the stature (height) of adults are based on the 19–65 age range [3 max].
by the age of 19 years most people have reached maturity in relation to height/will not grow taller;
after the age of 65 years most people reduce in stature;
due to shortening/curvature of the spine/stooping; [3]
3. (a) Award [1] for a definition of planned obsolescence.
a conscious act either to ensure a continuing market or to ensure that safety factors and new technologies can be incorporated into later versions of the product; [1]
- (b) Award [1] for each of three distinct correct points in an explanation of how the work of a designer influences both the cost and the value of a product [3 max].
decisions concerned with choice of materials/ease-of-production/surface finish/etc affect the cost/ WTTE;
such decisions impact on a product's characteristics/performance/aesthetics/retail cost;
which determine the value to a consumer; [3]

SECTION B

4. (a) (i) *Award [1] for stating a reason why analogy may have been the primary generator of ideas for the chair.*
the shape is like a nest, cocoon or shell / the idea has been taken from a different context; [1]
- (ii) *Award [1] for a possible reason for the name of the chair and [1] for a brief explanation [2 max].*
the name suggests a private (secret);
place for fun/entertainment/place for children to play (clubhouse); [2]
- (iii) *Award [1] for stating the type of production system for the chair and [1] for a brief explanation [2 max].*
craft;
the nature of the woven structure would be difficult/not cost-effective for mechanization/automation; [2]
- (b) (i) *Award [1] for stating the percentile used to decide the height of the seat from the floor.*
50th (adult); [1]
- (ii) *Award [1] for each of three distinct correct points in an explanation of one potential safety issue for the use of the chair [3 max].*
stability;
if a tall/heavy/more than one user leaned backwards;
the chair might topple over (from the shift of centre of gravity);

young children;
might view the chair as a plaything, stand on the seat and lean on the frame;
causing the chair to topple over;

high winds;
blowing from a direction which causes the wind to get inside;
lift the chair from the ground/blow it over; [3 max]

- (c) (i) *Award [1] for a possible maintenance issue for the chair and [1] for a brief explanation [2 max].*

if left outside in different weather conditions for a long time;
the wood may become mouldy/stained/textile seat become dirty;
needs to be treated/cleaned regularly;

the textile for the seat cover;
needs to be easy to clean;

the construction of the interwoven frame;
makes it difficult to apply a protective surface finish to all edges;

leaves blown by the wind;
could become trapped inside the chair;

birds/animals;
might be attracted to use the chair for refuge/nesting;

[2 max]

- (ii) *Award [1] for each of three distinct correct points in a discussion of each of three possible reasons why the Secret Clubhouse chair is likely to have a relatively high price when marketed [3 max] per reason [9 max].*

the product will not be high volume and so economies of scale will not be achieved;

it would not be cost-effective to create tooling to manufacture the chair by automation;
so expensive craft skills will be used;

design/manufacturing costs will be high;
the costs will not be spread across a high volume of sales;
the individuality/originality of the design requires much skill/time;

perceived value;
consumers expect high quality products to be relatively expensive;
and would assume inferior materials and construction techniques had been used if the product was cheap;

consumers with a high disposable income;
look to purchase novel/original designs;
and expect to/are willing to pay highly for them;

[9 max]

5. (a) (i) *Award [1] for stating the most important physical property for the choice of material for the Frisbee.*
density; [1]
- (ii) *Award [1] for stating the influence of market pull and technology push on the design of the Frisbee and [1] for a brief explanation [2 max].*
initially market pull created the impetus for the design as Morrison received enthusiasm for a flying disc game from beachgoers;
however, in order for the Frisbee to become a major innovation much technological development needed to take place; [2]
- (iii) *Award [1] for stating the major anthropometric consideration for the design of the Frisbee and [1] for a brief explanation [2 max].*
size of hand/fingers;
in order to ensure that the lip of the Frisbee can be gripped easily/comfortably/safely; [2]
- (b) (i) *Award [1] for stating the manufacturing technique for production of the Frisbee.*
injection moulding; [1]
- (ii) *Award [1] for each of three distinct correct points in an explanation of how the design of the Frisbee reflects radical and incremental thinking [3 max].*
radical in concept as it was a new form of entertainment/recreation;
but incremental in design development;
small changes over a long period of time; [3]
- (c) (i) *Award [1] for each of two distinct points in a description of the influence of fashion on the design of the Frisbee [2 max].*
trends;
Frisbee games are popular/unpopular at different timeframes/different market segments;

colours;
Frisbees can easily be manufactured in fashionable colours popular at different periods of time/suit different cultures; [2 max]

- (ii) *Award [1] for each of three distinct correct points in a discussion of the influence of science, technology and design to the innovation of the Frisbee [3 max] per factor [9 max].*

science:

performance of the Frisbee relies on knowledge from Physics;
so the aerodynamics of the shape is optimized;
in order to fly through the air efficiently;

technology:

technological developments in plastics materials were important to the development of the Frisbee in relation to ease-of-use /safety/durability/density;
technological developments in volume production/automation allowed the Frisbee to be manufactured cost-effectively/sold cheaply;
technological developments in manufacturing techniques/injection moulding suitable for use with thermoplastics;

design:

in order to sustain it as an innovation over many years;
and to make it suitable for a wide range of people/the global marketplace;
different versions of the Frisbee have been designed to suit different markets;

[9]

6. (a) (i) *Award [1] for stating a disadvantage of using polyurethane foam to manufacture the car seat in relation to green design.*
difficult/expensive to recycle;
causes toxic pollution at manufacture/disposal; **[1 max]**
- (ii) *Award [1] for an advantage of using polyurethane foam to manufacture the car seat in relation to comfort and [1] for a brief explanation [2 max].*
the density of the polyurethane foam can be controlled in manufacture;
to provide optimum levels of comfort for the range of users;

the polyurethane foam can be moulded;
to create a seat which supports the body well;

the foam creates a cushion;
which provides support for the body; **[2 max]**
- (iii) *Award [1] for a maintenance issue for the choice of material for the car seat cover and [1] for a brief explanation [2 max].*
the seat will become dirty/unhygienic in use;
the material must be easy to remove/clean/washable/resistant to detergents; **[2]**
- (b) (i) *Award [1] for stating a psychological factor relating to the ergonomics of the car seat.*
Texture/WTTE; **[1]**
- (ii) *Award [1] for each of three distinct correct points in a discussion of the life cycle of the car seat [3 max].*
the car seat is designed for children aged 9 weeks–12 years;
therefore it can be used while the child is growing up;
so the seat has a long life cycle and little/no planned obsolescence built in;

the car seat is made from durable/long-lasting materials;
the cover is removable for cleaning;
or it can be replaced to ensure a long life cycle for the seat;

although the seat is made from a tough/durable plastic with a long life cycle;
the various straps/fastenings may become loose/broken as the child wriggles around in the seat/causes damage to them;
and so reducing the product life cycle;

the seat is manufactured from a thermoset plastic/polyurethane;
which is not easy to recycle;
that poses disposal issues; **[3 max]**
- (c) (i) *Award [1] for a reason why the fabric cover for the car seat is designed to be breathable and [1] for a brief explanation [2 max].*
so when the car seat is used for a long time/in hot conditions moisture from perspiration does not accumulate between the surface of the seat and the body causing discomfort;
the breathable fabric allows air to escape from the foam;
so the foam will mould better to the individual shape of the child; **[2 max]**

- (ii) *Award [1] for each of three distinct correct in a discussion of how the evaluation strategies of user trial, field trial and performance testing would have been used in the design development of the car seat [3 max] per strategy [9 max].*

user trial:

the seat is intended to be used a wide age range/9 weeks–12 years;

users representing different ages/sizes within this range would be observed using the chair;

to test for adjustability of straps/cushions or comfort levels;

adults would be observed securing children in the car seat;

to test that a range of different adults can easily make adjustments to the fit of the chair;

with one hand;

field trial:

children and adults would be asked to use the chair for different journey ranges/road surfaces in order to test for safety/comfort;

over different periods of time;

the car seat is designed for use in a wide range of different types of vehicles; which will have varied shapes/sizes of rear seats;

the car seat will need to be tested by users with different types of cars to ensure that the car seat is suitable;

performance test:

the car seat is designed to protect children if the car brakes suddenly/is in a collision;

dummies of different sizes/weights representing the intended child age range;

will need to be used for crash testing;

materials testing for car seat cover;

testing for toughness/durability;

ease of maintenance for cleaning/hygiene;

materials testing for polyurethane foam;

to test for suitable densities;

in relation to comfort/safety/different user weight;

stress tests for the straps;

to ensure high enough factor of safety;

so providing extra safety;

tests for the locking mechanism;

to ensure they are reliable;

and the mechanism will not wear with continual use;

[9 max]