



MARKSCHEME

May 2013

DESIGN TECHNOLOGY

Standard Level

Paper 2

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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 the evaluation strategy used at the London Aquarium. performance test;* [1]
- (ii) *Award [1] for stating **one** reason why the test was done over a two-year period.*
to test durability of materials/waterproofing/reliability of electronics/
reactions of other sea creatures; [1]
- (iii) *Award [1] for each of two distinct correct points in an outline of **one** limitation of relying on the data generated from the London Aquarium evaluation [2 max].*
the evaluation is not testing the product in a fully realistic situation;
the data is constrained by the limitations of a controlled environment;

the aquarium tanks are relatively safe environments/do not replicate the
conditions of open water;
so the robots may perform differently in more hostile waters; [2 max]
- (b) (i) *Award [1] for **one** limitation of the use of the robotic fish in relation to data gathering and [1] for a brief explanation [2 max].*
limited range;
must be within communication distance of the hub;

does not identify type/name of polluter;
for example, name of ship;

limited to chemical pollution;
ignores other types of pollution;

may get damaged;
by contact with other fish;

battery life;
must return to hub after 8 hours for recharging; [2 max]
- (ii) *Award [1] for identifying the hazard and [1] for a brief explanation [2 max].*
storms;
fish could be damaged/destroyed;

large predators;
mistake the fish for real food;

large fishing nets;
nets could be launched while the fish are in the water and surround them; [2 max]

- (c) (i) *Award [1] for stating why the robotic fish are designed to resemble real fish. in order to blend naturally into the environment; fish shapes/movement are efficient when moving underwater;* **[1 max]**
- (ii) *Award [1] for each distinct correct point in an explanation of why it was necessary to develop a new type of composite material for the manufacture of the robotic fish [3 max].*
composites can be manufactured to provide pre-determined properties/ characteristics;
the robotic fish need to perform to specific requirements;
for example, mimic the movements of real fish/undulate; **[3]**
2. (a) *Award [1] for stating the symbol used in a flow diagram to represent a decision. diamond (accept a drawing);* **[1]**
- (b) *Award [1] for each distinct correct point in an explanation of why producing a prototype is a form of modelling [3 max].*
a prototype is an advanced/sophisticated/detailed model;
but it is still representing an idea/concept;
and is not the finished product / allows for testing; **[3]**
3. (a) *Award [1] for stating what is meant by physiological factors as part of ergonomics. factors pertaining to body movements/tolerances, for example, comfort/fatigue;* **[1]**
- (b) *Award [1] for each distinct correct point in an explanation of the relationship of quantitative and qualitative data to the concept of perception when considering ergonomics [3 max].*
quantitative data may be used in a design context relating to psychological factors for example, the temperature of an environment;
but people react differently to the same data so one person may perceive the environment as too hot/uncomfortable while another person finds it satisfactory/ comfortable;
so individual perceptions are based on qualitative data, for example, comfort rating;

perceptions usually generate qualitative data;
but a question can be scaled to produce quantitative data;
both types of data can be used to triangulate/increase reliability of data;

designers require balance between qualitative and quantitative data gathering;
quantitative data may be the basis of gathering qualitative responses to data for example, noise/temperature;
designers make a judgement of how much to take into account of qualitative responses for a design; **[3 max]**

SECTION B

4. (a) (i) *Award [2] for identifying the percentile range used to decide the height of the chair seat.*
50th (percentile);
adult (*accept male or female adult*); **[2]**
- (ii) *Award [1] for identifying **one** limitation of the chair when sitting on it for long periods and [1] for a brief explanation [2 max].*
hard surface (seat/backrest);
which could be uncomfortable when seated for long periods;

lacks upholstery/cushioning;
so causes pressure points/lacks comfort;

no arm rests;
so no support for the arms which can cause fatigue; **[2 max]**
- (b) (i) *Award [1] for each distinct point in an outline of the importance of ductility to the choice of material for the frame of chair [2 max].*
metal legs have been shaped by bending;
ductility is important to allow the metal to be bent easily;

metal tubes have been made by extrusion/drawn out;
ductility is an important consideration that allows metal to be extruded; **[2 max]**
- (ii) *Award [1] for each of three distinct points in a suggestion of **one** reason why the chair is manufactured in China [3 max].*
cost-effectiveness;
manufacturing costs are usually much cheaper in China than in Scandinavia;
despite extra distribution/transport costs; **[3]**
- (c) (i) *Award [1] for identifying **one** way in which the design of the chair facilitates repair and [1] for a brief explanation [2 max].*
the chair can be disassembled by undoing the fasteners;
so the parts can be repaired if it becomes scratched/worn or it can be replaced; **[2]**

- (ii) *Award [1] for each of three distinct correct points in an explanation of **three** advantages of using plywood to produce the chair seat and backrest. [3 max] per advantage [9 max].*

plywood has a good strength to weight ratio;
which means it can be used effectively in thin sections;
which makes the chair light/aesthetically pleasing;

plywood can be shaped easily;
to produce the curves for the seat/backrest;
which makes it cost-effective for manufacture;

plywood can be manufactured with a variety of surface veneers;
to provide consumers with choice;
and so create a wider market;

plywood can be used effectively with a range of fasteners;
for example, screws/bolts;
due to the structure of the board;

plywood is a readily available material;
with little resource implications;
as it can be manufactured from a variety of different timbers;

[9 max]

5. (a) (i) *Award [1] for each of two distinct points in an outline of **one** market segment for the flashlight based on consumer attitudes to green design.*

ecofans;
who enthusiastically adopt environmentally friendly products as consumers;

[2]

- (ii) *Award [1] for identifying **one** limitation of the flashlight in relation to product life and [1] for a brief explanation [2 max].*

batteries will need replacing at some point;
depending on how much the product is used and the batteries recharged;

the handle/casing/bulb could get broken/damaged;
due to overwinding/because as a protruding part it is vulnerable to damage;

moisture;
if it is used for camping/hiking, etc. moisture could penetrate the casing and
cause damage/malfunction to the electrical components;

[2 max]

- (b) (i) Award [1] for each of two distinct points in an outline of **one** reason apart from aesthetics for designing the flashlight in bright colours.
so it stands out in dark/dim conditions;
for example, at night in a tent;
- marketing;
differentiates it from competitive products; [2 max]
- (ii) Award [1] for each of three distinct points in a suggestion of **one** reason for designing the flashlight with a transparent body in relation to style [3 max].
contemporary/modern appearance;
compatible with other well known products which use a similar style;
the style is part of an imitative strategy;
- market segmentation;
the style appeals to young consumers;
because of its contemporary appearance;
- brand identity;
other Freeplay products, for example, clockwork radio are transparent;
the style facilitates marketing of the product; [3 max]
- (c) (i) Award [1] for each of two distinct points in an outline of **one** disadvantage of the flashlight when stored in a backpack during hiking [2 max].
handle protrudes/not compact;
could stick in the back when walking with the backpack on;
- awkward shape;
handle sticks out / handle might get tangled with clothing/get caught up with
cords/straps/gets broken; [2 max]
- (ii) Award [1] for each of three distinct correct points in an explanation of how the flashlight represents a hybrid of **three** corporate strategies. [3 max] per strategy [9 max].
product development;
the flashlight builds on an established brand;
that was pioneered by the design of the wind-up radio;
- market development;
the company identified a new market for “greener” products;
especially amongst younger people;
- diversification;
the company diversified from the original radio;
to produce a range of wind-up products;
- imitative;
similar “wind up” ideas already available;
incorporate into product range; [9 max]

6. (a) (i) *Award [1] for each of two distinct points in an outline of how adaptation has been used in the design of the crusher.*
the idea for the shape and size has been adapted from an existing product;
it resembles a normal flip-top bin/crushing mechanism; [2]
- (ii) *Award [1] for each of two distinct points in an outline of **one** reason for the choice of the colour scheme for the crusher [2 max].*
green used to emphasize the green credentials of the product;
a neutral colour/white for the main body of the crusher so it does not clash with any other colours in the environment;
white represents clean; [2 max]
- (b) (i) *Award [1] for each of two distinct points in an outline of **one** maintenance issue with the crusher related to hygiene [2 max].*
someone will need to clean inside the crusher regularly;
as people might put in bottles/cans half full of liquid which will spill when crushed;

spilt liquids containing sugars;
will attract flies/insects; [2 max]
- (ii) *Award [1] for each of three distinct points in a discussion of **one** disadvantage for a large company employing 500 people in a multi-storey building of purchasing the Minima [3 max].*
cost;
the company would need to purchase many crushers;
for use on different floors/parts of the building;

convenience;
if the crusher was not near to where an employee worked;
valuable time would be used walking to and from its location/employees may not make the effort to put their cans and bottles in the crusher; [3 max]
- (c) (i) *Award [1] for each of two distinct points in an outline of **one** reason why office workers may not always use the crusher as intended [2 max].*
workers may forget to press the button;
or be interrupted when using the bin;

ignorance;
workers may not know how to operate the mechanism;

apathy;
workers may just prefer to use it as a conventional bin/not care about environmental issues; [2 max]

- (ii) *Award [1] for each of three distinct correct points in an explanation of **three** limitations of the Minima can/bottle crusher as an environmentally friendly product. [3 max] per reason [9 max].*

depends where in the world it is used;
and how the electricity is generated;
and how much carbon is produced by the process;

depends on the method of transport for recycling cans/bottles;
if it is carbon neutral then the gain will be much reduced;
for example, solar powered vehicles;

depends on the method of recycling for plastic bottles/metal cans;
and how much carbon is produced in the recycling process;
as the amount of material to be recycled is the same whether the cans/bottles are crushed or not;

it has electronic/mechanical components;
which can become damaged by liquids/be unreliable;
the machine may need repair/maintenance / requires further energy/
resources which are detrimental to the environment;

it uses electricity;
electricity may be produced using fossil fuels;
which cause pollution/waste;

use of plastic bags to collect the waste;
which are made using carbon-producing processes;
which have environmental implications;

does not separate out the three materials (plastics, steel, aluminium);
they will need separation at the recycling plant;
which will absorb/use energy in the separation process;

planned obsolescence/there is a limited product life;
due to the various components;
compared to a standard bin, which is very long lasting;

[9 max]
