Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2015

Design technology

Standard level

Paper 2

10 pages

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 property important to create gold wire.*
ductility; **[1]**

(ii) *Award **[1]** for stating the property important for use of gold wire in electronic circuits.*
electrical resistivity (conductivity); **[1]**

(iii) *Award **[1]** for stating one benefit of the high purity of gold for electronic circuits and **[1]** for a brief explanation.*
the purity value needs to be high for electrical conductivity to be effective in such thin wires;
impurities would create interference in the signal; **[2]**

(b) (i) *Award **[1]** for stating which aspect of demand for gold is likely to increase at a fast, consistent rate during the next ten years and **[1]** for a brief explanation.*
technology;
limited product life cycle for electronic products so more opportunities for recycling/increased demand for electronic devices as global wealth increases; **[2]**

(ii) *Award **[1]** for stating one reason why gold used for jewellery may not be recycled even though the jewellery becomes unfashionable and **[1]** for a brief explanation. **[2 max]**.*
gold jewellery is expensive/precious to most people so is often kept for a long time even if not worn;
the jewellery may become a family heirloom and handed down through generations;

many items of gold jewellery can be disassembled and the gold parts reassembled for a new design;
rather than melted down for recycling;

weight for weight gold for melting down is worth less than gold in jewellery;
so consumers may consider it worth keeping the jewellery and hope it comes back into fashion;

much gold jewellery in circulation transcends contemporary fashion;
it may be kept to wear on special occasions/can be worn with varied types of fashionable clothing;

there is a high demand for second-hand jewellery;
so items are often resold when no longer required; **[2 max]**

(c) (i) *Award **[1]** for stating one advantage of touchscreens for mobile (cell) phones being more flexible than glass. **[1 max]**.*
less chance of damage if dropped;
safer if damaged; **[1 max]**

(ii) *Award **[1]** for each distinct point in an explanation of why increasing the amount of gold that is recycled from technology may be difficult.*
global marketplace but recycling facilities limited geographically;
collection and distribution costs high;
much investment required and currently technology relatively small percentage of demand;
time consuming as difficult to separate the small amounts of gold out of the product; **[3 max]**

2. (a) *Award **[1]** for stating why timber is a natural composite material.*
it is composed of cellulose fibres in a lignin matrix; **[1]**

(b) *Award **[1]** for each distinct point in a comparison of the use of pinewood with mahogany as materials for flooring in relation to safety for users.*

both timbers may produce splinters which could cause injury to users;
however, pinewood is more likely to splinter as the grain pattern is very wide;
mahogany has a close grain and is less likely to splinter;

mahogany is harder and more durable making it less likely to wear over time;
which would minimise the potential for the floor to become worn/slippery;
however both timbers can be treated with a hardening finish;

[3]

3. (a) *Award **[1]** for stating what is meant by "pseudo-elasticity" with reference to shape memory alloys (SMAs).*
the shape memory effect on the material caused by a load (force) allows severe deformation of the material but it returns to its original shape after heating; **[1]**

(b) *Award **[1]** for each distinct point in an explanation of why composite materials are usually difficult to recycle.*
composite materials are a combination of different materials joined/mixed/blended together;
they are very difficult to separate into the constituent materials which is necessary for recycling;
and some composite materials are designed by large corporations for specific applications with their composition kept secret; **[3]**

Section B

4. (a) (i) *Award **[1]** for stating the physical property of cardboard which makes it appropriate to use for the bicycle in **Figure 4**.*
toughness; **[1]**

(ii) *Award **[1]** for stating one limitation of the surface finish of the cardboard bicycle in relation to life cycle and **[1]** for a brief explanation.*
the surface is likely to get scratched;
then the cardboard will be exposed and become less waterproof/less durable; **[2]**

(iii) *Award **[1]** for stating one limitation of the use of the cardboard bicycle by people in developing countries who need it as a main form of personal transport and **[1]** for a brief explanation.*
it will be difficult to attach products for storage/carrying;
cardboard is not a good material to drill holes *etc* so potentially weakening the frame;

road conditions may not be suitable;
making the bike uncomfortable/difficult to ride; **[2]**

(b) (i) *Award **[1]** for stating the ideas generating technique which acted as a stimulus for the design of the cardboard bicycle.*
adaption; **[1]**

(ii) *Award **[1]** per distinct point in a discussion of the design of the cardboard bicycle in relation to safety.*
when used in developing countries the roads are likely to be very rough;
the frame of the bicycle may become weak with constant vibration;
and cause an accident/endanger the rider;

tyres can not be changed/modified;
which may not be suitable for all road or weather conditions;
which may lead to rider accidents;

the bicycle is lightweight;
which could cause it to become unstable in windy conditions;
which may lead to rider accidents; **[3]**

(c) (i) *Award **[1]** for stating the scale of production for the cardboard bicycle and **[1]** for a brief explanation.*
batch;
produced in a range of sizes so limited/set number for each size; **[2]**

(ii) *Award **[1]** per distinct point in a discussion of the ergonomics of the cardboard bicycle in relation to physiological factors, psychological factors (perception) and anthropometrics. **[3 max per ergonomic consideration]**.*
physiological:
the bicycle is a simple design with a minimum of working parts;
comfort is compromised by the hard seat/tyres;
the bicycle does not have gears so the rider will have to work hard to travel uphill/will become more fatigued;

psychological:
users will need to come to terms with the perception that the bicycle is not safe/robust enough;
and it is suitable for use as with a conventional metal bicycle;
and is not just a toy/plaything;

anthropometrics:
no adjustability/limited range of sizes;
so not very suitable as a good fit for a wide range of users;
which could impact on efficiency of cycling/safety; **[9]**

5. (a) (i) *Award **[1]** for stating the ideas generating technique which acted as the stimulus for the design of the microwave oven in **Figure 5**.*
analogy; **[1]**

(ii) *Award **[1]** for stating why it is unlikely that most users would benefit from the 360° view of food being cooked and **[1]** for a brief explanation.*
most microwaves are placed on kitchen work surfaces next to a wall/cupboard/not in a freestanding area;
users would not therefore be able to see all the way round the oven; **[2]**

(iii) *Award **[1]** for stating how the Fagor company might meet energy labelling requirements for the Spoutnik oven in a global marketplace where the requirements vary depending on the geographical location and **[1]** for a brief explanation.*
in order to be able to sell the Spoutnik in all regions the company should aim to reach the most stringent requirements;
and so exceeding the requirements of some regions; **[2]**

(b) (i) *Award **[1]** for stating the product life cycle stage for microwave ovens.*
mature; **[1]**

(ii) *Award **[1]** for each distinct point in an explanation of one limitation of the design of the microwave oven in **Figure 5** for integrating it into a contemporary kitchen layout.*
shape;
contemporary kitchen designs usually have integrated appliances/appliances hidden behind cupboard doors/in enclosed spaces;
rectangular shapes appliances are usually necessary for this purpose/round shapes do not meet a typical modular design standard; **[3]**

(c) (i) *Award **[1]** for stating the physical property important for the choice of a suitable material to ensure the safety of the body of the microwave oven in **Figure 5** and **[1]** for a brief explanation.*
thermal conductivity;
the material must be able to resist the heat from inside the oven and not be hot to touch on the outside; **[2]**

(ii) *Award **[1]** for each distinct point in an explanation of how the design team might use the strategies of user trial, user research and performance test as part of the research and development phase for the Spoutnik microwave oven. **[3 max per strategy]**.*
user trial:
evaluate ease-of-use/by observing users trialling the product;
carry out controlled trials to gain quantitative data;
with different users in relation to percentile ranges/experience with microwave ovens;

user research:
gather qualitative data regarding ease of use/performance/functionality;
in relation to the aesthetics of the oven;
which are important selling points;

performance test:
test for safety with user/a variety of food types;
test for reliability so controls/mechanisms work well in different conditions;
test for durability of materials/ease-of-cleaning; **[9]**

6. (a) (i) *Award **[1]** for stating the manufacturing technique used to join together the components of the table and chair set.*
fasteners/screws/bolts/KD (knock down fittings); **[1]**

(ii) *Award **[1]** for stating the design for manufacture (DfM) strategy which has been a dominating constraint on the design brief for the table and chairs and **[1]** for a brief explanation.*
design for assembly/disassembly;
the concept is flat-pack furniture so whatever the type of design it must conform to this concept; **[2]**

(iii) *Award **[1]** for stating how mass customization could improve the appeal of the table and chairs for consumers and **[1]** for a brief explanation.*
consumers could modify/customise the design to suit their taste/preferences;
such as surface finish/decoration/shape of the cut-outs/colour; **[2]**

(b) (i) *Award **[1]** for stating the most appropriate type of drawing to use with instructions to show consumers how to self-assemble the table and chairs.*
exploded isometric/perspective; **[1]**

(ii) *Award **[1]** per distinct point in a discussion of the design of the table and chairs in relation to planned obsolescence. **[3 max]**.*
the surface finish may not be very durable/scratch resistant;
this type of furniture is likely to be used much and be knocked/scratched easily;
this will spoil the look of the furniture and probably be discarded by the user even though it still functions;

the composite timber is not long-lasting/durable;
especially if it comes into contact with moisture;
spillages from drinks are likely when it is used;

the joining technique is not as long-lasting as traditionally jointed furniture from natural timber;
the fasteners could work loose when the furniture is used a great deal;
and the structure becomes unstable;

if the furniture has been designed for disassembly/no adhesives used;
damaged components can be replaced as it is a modular design;
extending the life cycle; **[3 max]**

(c) (i) *Award **[1]** for stating the impact of research and development (R&D) costs on the final cost of the table and chairs and **[1]** for a brief explanation.*
low;
the technology involved is not new/innovative so little need for much R&D;

medium/high;
to determine market viability; **[2]**

(ii) *Award **[1]** per distinct point in a discussion of **three** considerations for the design of the table and chairs in relation to cost-effective manufacturing. **[3 max per consideration]**.*
modular design;
repetitive so jigs/templates can be used;
which makes manufacturing efficient;

suitable for CAM;
simple shapes so easy to cut out with CNC machinery;
and join together;

limited colour range;
easier to decide how many to produce in each of the three colours;
less waste;

flat-pack design from sheet material;
considerable waste material from cutting out the shapes;
off-cuts from manufacture irregular shapes so not very suitable for re-use; **[9]**