



Markscheme

November 2015

Design technology

Higher level

Paper 2

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Subject Details: Design Technology HL Paper 2 Markscheme

Mark Allocation

Candidates are required to answer **ALL** questions in Section A (total **[40 marks]**) ONE question in Section B **[20 marks]**. Maximum total = **[60 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 reason why the relative percentage of data stored on CDs and MiniDisks reduced from 2000 to 2007.
more opportunity to download music from the internet;
PC Hard drive technology improved / DVD's more storage available **[1]**
- (ii) Award **[1]** for stating the percentage of analogue media for the year 2000.
75%; **[1]**
- (iii) Award **[1]** for identifying the correct figures and **[1]** for the correct answer in a calculation of the increase in data stored on PC hard-disks between 2000 and 2007.
 $(0.42 \times 295) - (0.05 \times 54)$;
121.2 exabytes; **[2]**
- (b) (i) Award **[1]** for stating one reason for the dramatic rise in the amount of data stored on a PC hard-disk from 2000 to 2007 and **[1]** for a brief explanation.
[2 max]
hard disk capacity;
technology has allowed hard disks to be able to hold more information;

changes in behaviour/lifestyle;
people use computers much more and need to store large amounts of data;

increase in working from home;
computers with large data storage essential to many home workers;

increase in use of home computers for storing images;
which require large data storage/more complex software/files;

demographics;
young people much more confident/expert at using different
computer software; **[2 max]**
- (ii) Award **[1]** for stating one reason why the data percentages shown in **Figures 1 and 2** are likely to be an extrapolation and **[1]** for a brief explanation.
it is too difficult/impossible to gather data for such a wide variety of products globally;
and for such a long time period; **[2]**
- (c) (i) Award **[1]** for stating which digital technology had the biggest impact on the decline of analogue video by 2007.
DVD/Blu-ray; **[1]**
- (ii) Award **[1]** for each distinct point in an explanation of the influence of planned obsolescence on the data shown on the charts in **Figures 2 and 3**.
most technological/electronic products are designed to have a short life cycle;
new technological developments are used to provide consumers with more advanced products based on digital technology;
these products have improved performance by being able to store more data; **[3]**

- (d) (i) Award **[1]** for stating one method of gathering customer data for a company loyalty card application. **[1 max]**.
 online application form;
 by post via a paper application form;
 in-store application via a company employee;
 survey/questionnaire; **[1 max]**
- (ii) Award **[1]** for each distinct point in a suggestion of one way in which the company issuing the loyalty cards may extrapolate information from continued use of the card by individual customers. **[3]**
 customer purchasing habits;
 the level of regular spending and so disposable income;
 the type of products purchased and so type of lifestyle;
- (e) (i) Award **[1]** for one benefit of the loyalty card scheme to the company apart from specific data gathered from the use of the cards and **[1]** for a brief explanation. **[2 max]**.
 improved relationship/image with customer base;
 the company is seen to promote loyalty and look after its customers/customers stimulated to buy more to gain further offers / leads to increased sales for company;
 improved stock control;
 the store can monitor more easily sales trends/ensure continuity of supply/differentiate between regional purchasing trends;
 improved supply chain;
 the company can plan more effectively to provide customers with the type of products they want to purchase; **[2 max]**
- (ii) Award **[1]** for one disadvantage to customers of having their data stored on the loyalty card and **[1]** for a brief explanation. **[2 max]**.
 customers may be targeted for marketing/promotions;
 of products they do not want/cannot afford;
 customers may feel pressurised to continue to shop at the store;
 even though they may obtain better value-for-money elsewhere;
 customer related data may be stored insecurely/passed on to other companies;
 without the customer's knowledge/permission; **[2 max]**

2. (a) *Award [1] for stating how energy is converted from one form to another for a kite in flight.*
the kinetic energy of the wind is converted into gravitational potential energy of the kite; [1]
- (b) *Award [1] for each distinct point in an explanation of why some governments promote the use of nuclear power as part of their renewable energy policy. [3 max].*
very low carbon (dioxide) emissions;
high energy density;
not tied to a particular geographical location;
reliable source of energy;
help meet agreed targets; [3 max]
3. (a) *Award [1] for each point in a description of a simple gear train.*
two gears meshed together with input and output in opposite directions;
velocity ratio is dependent upon the relative sizes of the two individual gears; [2]
- (b) *Award [1] for each distinct point in a description of how a bevel gear works.*
two gears meshed together/simple gear with shafts at 90° to each other;
which allows rotational direction/forces to be transmitted through 90° /if different sized gears are used the speed of rotation can be increased/decreased; [2]
4. (a) *Award [1] for stating an important characteristic of metals which makes them suitable for high pressure die-casting.*
low melting point; [1]
- (b) *Award [1] for each distinct point in an explanation of why high pressure die-casting is suitable for the manufacture of hip replacements.*
hip replacements are intricate/detailed products requiring high accuracy of manufacture;
a good surface finish is important in order for the parts to interlock/move smoothly/surface does not require further finishing;
hip replacement operations are quite common/happen regularly so volume production is necessary to create cost-effect products; [3]
5. (a) *Award [1] for each of two advantages of friction welding.*
strong joint;
neat finish;
allows for dissimilar materials to be joined;
thermoplastics;
little or no waste; [2]
- (b) *Award [1] for stating a suitable adhesive for use when constructing a boat deck from hardwood and [1] for a brief explanation.*
cascamite;
waterproof;
- epoxy resin;
waterproof and highly elastic [2]

6. (a) Award **[1]** for stating the percentile value used to decide the height of a wash basin.
50th (adult); **[1]**
- (b) Award **[1]** for each distinct point in an explanation of why people working in the same interior environment often differ in what they regard as thermally comfortable. **[3 max]**.
different basal metabolic rate;
depends on the level of physical activity;
what type/amount of clothing is worn;
their individual perception;
Whether exposed to direct sunlight/draughts; **[3 max]**

Section B

7. (a) (i) *Award [1] for stating why the Barcelona chair may be considered a dominant design and [1] for a brief explanation.*
 continues to sell;
 virtually unchanged since 1928; [2]
- (ii) *Award [1] for stating one way in which companies wishing to produce cheaper versions of the Barcelona chair can make changes without altering the look of the chair and [1] for a brief explanation. [2 max]*
 use plastic instead of leather;
 use aluminium instead of stainless steel/use a cheaper metal for the frame;
 cheaper joining techniques/use of fasteners; [2 max]
- (b) (i) *Award [1] for each distinct point in a description of how the strategy of reconditioning could be used to extend the life cycle of the Barcelona chair. [2 max].*
 the cushion could be re-upholstered if torn/worn;
 and the foam filling replaced to keep it in shape;

 the steel frame could become scratched;
 so it could be re-polished;

 some of the straps will probably become stretched/weakened;
 they can be individually replaced; [2 max]
- (ii) *Award [1] per distinct point in a discussion of the Barcelona chair in relation to fashion. [3 max].*
 the chair is a classic/iconic design;
 it is fashionable in relation to this status;
 it was fashionable/stylistic/contemporary in 1928;

 the chair is not a fashion statement in the contemporary sense;
 it transcends styles that come and go;
 it is fashionable as a high class piece of furniture/classic design; [3 max]

- (c) (i) Award **[1]** for stating how the metal frame of the Barcelona chair would have been joined together and **[1]** for a brief explanation.
fused/welded;
this creates a permanent/strong joint; **[2]**
- (ii) Award **[1]** per distinct point in a discussion of how the designer has balanced strength with stiffness in the choice of materials for the seat base, the cushion and the frame of the Barcelona chair. **[3 max per seat component]**.
- Seat base:*
leather chosen and used in strip form to provide support for the sitter and to distribute the forces to the steel frame;
leather is available in different densities which affects the stiffness of the material;
the leather straps deform elastically to provide comfort but need to be strong enough not to break under the external loading;
- Seat cushion:*
the leather and plastic foam materials are both strong;
they also deform elastically but are stiff enough to provide support to the body;
the stiffness of the seat depends on the density of foam used for the filling;
- Steel frame:*
steel is very strong and the forces exerted by the user are transmitted to the frame;
which is very stiff so does not deflect under the load;
there is no discernible elastic deformation; **[9]**

8. (a) (i) *Award [1] for stating one reason why a global company such as Coca Cola would want a range of plastic cups and [1] for a brief explanation. [2 max].*
 promote its brand;
 by placing cups in bars etc. which sell its drinks;
- promote its image with consumers;
 for supporting green design/environmentally friendly ideas; **[2 max]**
- (ii) *Award [1] for stating how the Coca Cola cup can be viewed as an example of incremental and radical design without consumers knowing it is made from 100% recycled plastic and [1] for a brief explanation.*
 incremental as the shape/texture of the cup imitates the classic Coca Cola bottle;
 radical in the use of a range of bright colours for which coca Cola is not traditionally known/radical in moving away from a glass bottle to a plastic cup; **[2]**
- (b) (i) *Award [1] for stating a suitable manufacturing technique for the production of the Coca Cola cups shown in **Figure 7** and [1] for a brief explanation.*
 injection moulding;
 cost-effective for this type of product/easy to produce the shape and texture; **[2]**
- (ii) *Award [1] for each distinct point in an explanation of the corporate strategy used by Coca Cola in commissioning Invicta Plastics to produce the plastic cups for them.*
 market development;
 Coca Cola is a well-established global company;
 but wants to expand its market to appeal to ecofans/reinforce its brand identity for responsible/contemporary design; **[3]**

- (c) (i) *Award [1] for stating the potential product life cycle of the plastic cups shown in **Figure 7** and [1] for a brief explanation. [2 max].*
 plastic is durable so potentially a long life-cycle;
 but this is unlikely as the cups will be viewed as cheap/disposable items;

although plastic is a durable material so long-lasting;
 continued washing with detergents will cause it to degrade/colour to fade;

however, it can be taken to a recycling plant and the plastic used for another product;

[2 max]

- (ii) *Award [1] per distinct point in a discussion of how Invicta Plastics reflects the three key dimensions of triple bottom line sustainability in its corporate strategy. [3 max per dimension].*

Economic:

profit driven company;
 makes a contribution to the countries' economy;
 trickle-down strategy by being prepared to share expertise with other UK based companies so increasing economic benefits;

Environmental:

uses 100% recycled plastic so no use of virgin plastic materials which cause environmental damage to manufacture;
 Invicta products designed for a long product life and can be recycled again at the end of the cycle;
 reduces amount of material for landfill/possible reduction in use of energy resources;

Social:

injection moulding process allows for cultural identity to be built into the design of products/ mass customization;
 policy of sharing technical expertise with other manufacturers is an example of accessibility;
 also empowerment as it allows economic and environmental sustainability to be shared with others;

[9]

9. (a) (i) *Award [1] for stating the influence of market pull on the design of the Pouchlink machine and [1] for a brief explanation.*
the designers are capitalizing on an increasing market for more eco-friendly products/systems;
particularly by targeting schools where environmental issues play an important part in the curriculum/teachers or managers may feel a moral obligation to use such a product in place of a conventional machine/want to promote healthier products; [2]
- (ii) *Award [1] for stating the influence of technology push on the design of the Pouchlink machine and [1] for a brief explanation. [2 max].*
the technology of using pouches for drinks is not new/radical;
but the designers will have had to undertake much R&D to apply the concept to the type of drinks product;
it is a technology system design rather than a product design; [2 max]
- (b) (i) *Award [1] for stating the evaluation strategy represented by the offer to schools and [1] for a brief explanation.*
field trial;
schools have a free two week period to see if the system is popular with students before deciding whether to purchase/rent a machine; [2]
- (ii) *Award [1] per distinct point in a discussion of **one** disadvantage of the Pouchlink drinks containers in relation to ergonomics.*
the pouches are flexible not rigid so are not as easy to handle as cans/bottles;
especially as the liquid in them is likely to be consumed in stages;
so as air replaces liquid the flexibility of the pouch will increase and make it more difficult to handle/drink from/liquid may spill when pouch is held too tightly; [3]
- (c) (i) *Award [1] for stating the feature of the Pouchlink drinks system which will be the most energy intensive and [1] for a brief explanation.*
cooling system;
flash chilling the liquid requires large amounts of energy; [2]

- (ii) Award **[1]** per distinct point in a discussion of **three** ways in which the Pouchlink machine helps to conserve resources. **[3 max per way]**.

Packaging:

uses less packaging than conventional drinks machines;
as the pouches use less raw materials than bottles/cans;
which are also energy intensive to manufacture;
pouches weigh less than bottles/cans so reducing energy for distribution;

Transportation:

less energy used for transport/distribution;
as it is a self-cleaning machine;
so energy is saved as there is no need for visits from the company to clean inside the machine;

Storage:

the pouches take up less space than bottles/cans;
the machine stores a great deal more drinks than a conventional machine before it needs re-stocking;
so saving on material resources/warehousing resources;

Water:

water is only used when the drink is purchased;
so reducing waste from unused drinks/out-of-date products;
water is used from the mains supply rather than bottled water;

less energy in distribution from factory to site;
as the pouches will weigh less than canned/bottled drinks;
so less energy used to distribute them;

[9 max]
