



# **MARKSCHEME**

**November 2012**

**DESIGN TECHNOLOGY**

**Standard Level**

**Paper 2**

13 pages

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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. Do **not** award more than the maximum marks allowed for part of a question.
2. Each marking point has a separate line and the end is signified 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 writing **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. Indicate this with **ECF** (error carried forward).
10. Only consider units at the end of a calculation. Unless directed otherwise in the markscheme, unit errors should only be penalized once in the paper. Indicate this by writing **-1(U)** at the first point it occurs and **U** on the cover page.
11. Do not penalise candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

**SECTION A**

1. (a) (i) *Award [1] for stating the total amount of the annual electricity bill for the building shown in Figure 1.*  
£5 million - £2 million = £3 million ; **[1]**
- (ii) *Award [1] for stating how many litres of water are consumed in the building each year.*  
39 million litres  $\times 4 = 156$  million litres per year;
- OR
- 117 million litres (157 – 39); **[1 max]**
- (iii) *Award [1] for each point in an outline of one reason why the water cooling system is limited to 1000 desks [2 max]*  
some of the 3000 staff will be support staff (e.g. caterers, cleaners);  
and will not have a desk;
- some office workers may not have a computer on their desk;  
may share a computer;
- some desks may be in locations which are unsuitable for the water cooling system;  
because of the supply network/nature of the system;
- a design decision;  
based on an understanding of the use of computers in the building; **[2 max]**
- (b) (i) *Award [1] for each point in an outline of one reason why the system for using rainwater may not be suitable for all of the companies offices worldwide [2 max]*  
office may be located in parts of the world with small amounts of rainfall;  
therefore not enough water will be available; **[2]**
- (ii) *Award [1] for each point in an outline of one reason why the rainwater used for flushing toilets needs to be filtered [2 max]*  
so any impurities do not cause sediment/clog up the system;  
which needs to flow freely to operate successfully;
- moss/soil on the roof;  
residue needs to be filtered out; **[2 max]**

- (c) (i) Award [1] for stating the number of recycling stations required.  
30; [1]
- (ii) Award [1] for each point in a suggestion of one reason for limiting the system of rainwater use for flushing toilets to the bottom four floors of the building (other than the number of staff on each floor) [3 max].  
the water is stored in a tank at the base of the building;  
so the higher the floors, the more energy would be needed;  
to pump the water to the toilets;
- there may be a limited amount of rainwater collected,  
especially in the summer months;  
so not enough to serve the whole building;
- if the tank is on the upper level water could be gravity fed;  
this may only be effective for lower floors; [3 max]
2. (a) Award [1] for defining fixed costs.  
the costs that must be paid out before production starts, which do not change with the level of production; [1]
- (b) Award [1] for each point in an explanation of the concept of the break-even point in relation to fixed and variable costs [3 max].  
once break-even point has been reached, profits can be made;  
because fixed costs have been covered;  
variable costs will continue to rise with increased production; [3]
3. (a) Award [1] for each point in a description of what is meant by grain size in relation to metals [2 max].  
grain size refers to the arrangement of crystals;  
which form a different pattern for different metals; [2]
- (b) Award [1] for each point in a description of how the tensile strength of a metal is increased by alloying [2 max].  
the base metal is mixed with another metal with a higher tensile strength;  
resulting in increased tensile strength; [2]

**SECTION B**

4. (a) (i) Award [1] for stating the type of bonding for the thermoplastic used to manufacture the beads.  
covalent; [1]
- (ii) Award [1] for each point in an outline of the molecular structure of a thermoplastic [2 max].  
linear chain molecules; [2]  
with weak secondary bonds between them;
- (iii) Award [1] for each point in an outline of the scale of production for the plastic beads [2 max].  
mass; [2]  
the beads are produced for a variety of applications/it is not cost-effective to produce the beads in small numbers;
- (b) (i) Award [1] for stating the evaluation strategy used for a prototype of the cartridge.  
performance testing; [1 max]  
field trial;
- (ii) Award [1] for each of three distinct points in a suggestion one reason why the Research and Development costs for the HaloPure system are so high [3 max].  
it took many years to develop;  
complex process involving many people/specialists;  
many iterations of testing to ensure it is safe;  
  
lots of legislation to pass through;  
investment into manufacturing processes;  
to get the combination of beads and bromide correct; [3 max]

- (c) (i) *Award [1] for each point in an outline of one benefit of using design for disassembly for the design of the cartridge [2 max].*  
if it can be easily taken apart at the end of its life;  
the beads can be replaced and the cartridge re-used; **[2]**
- (ii) *Award [1] for each point in a discussion of three potential limitations of the HaloPure water purification system for use by people in developing countries [3 max] per issue.*  
type of water;  
amount of impurities;  
and so the impact on the bromide/beads/product life cycle;
- how much water is used;  
so how often the cartridge needs to be replaced;  
in order to maintain a clean water supply;
- availability of the cartridges;  
in remote areas of the world;  
in order to maintain a continuous supply of clean water;
- initial purchase cost;  
and replacement cartridges may increase in price;  
which makes them too expensive for existing users; **[9 max]**

5. (a) (i) *Award [1] for stating one advantage of the cleaner having a telescopic handle.*  
adjustable/suitable for different height users;  
more compact for storage;  
accessing small/tight spaces; **[1 max]**
- (ii) *Award [1] for each point in an outline of one possible reason for naming the floor cleaner Shark Sweeper in the US [2 max].*  
suggests that the cleaner will be a large predator;  
of dust/grit in the house;  
  
the name stands out in people's minds;  
so easy to remember when deciding to purchase a new cleaner;  
  
novelty;  
makes it more appealing to some customers; **[2 max]**
- (iii) *Award [1] for each point in an outline of one possible reason why the floor cleaner was named Gtech when launched in the UK [2 max].*  
it was an established product as part of a family of products;  
so the company name is used and a separate code to identify each product;  
  
*Shark Sweeper* was not thought suitable for the UK market;  
the UK is not known for shark infested waters;  
  
*Gtech* is based on the founder's name;  
*i.e.* G refers to Grey and Tech emphasises the importance of the technology; **[2 max]**
- (b) (i) *Award [1] for stating one disadvantage of the floor cleaner being cordless.*  
consumer may need to use the cleaner while it is being charged;  
consumer has to remember to recharge the cleaner/how long it has been used; **[1 max]**
- (ii) *Award [1] for each point in a comparison of the use of models with the use of prototypes to develop the floor cleaner [3 max].*  
models and prototypes are used in different stages of the product development;  
models are used by designers to develop design ideas;  
prototypes are used to test the design/suitability for manufacture;  
  
models are used to represent certain aspects/features of the product;  
and take place at various stages of the design cycle;  
while prototypes are representatives of the complete product and occur late in the design cycle;  
  
models and prototypes allow for different types of evaluation/feedback;  
prototypes are also more useful for planning full scale production;  
as they are full size/contain all components; **[3 max]**



- (c) (i) *Award [1] for each point in an outline of the corporate strategy used by Gtech since 2003 [2 max].*  
diversification;  
developed different products; [2]
- (ii) *Award [1] for each point in a discussion of why Nick Grey may be considered an inventor, innovator and entrepreneur [3 max] per each aspect.*  
*Inventor:*  
grey had the technical knowledge/broad skill set to develop a cordless vacuum cleaner;  
he had the determination to develop his idea into a working product;  
he had enough creativity to solve the problems with the design;
- Innovator:*  
grey had a good knowledge of the market;  
he identified a potential market for a new product;  
he had an understanding of manufacturing requirements;
- Entrepreneur:*  
grey had a developed set of business skills/knowledge/financial acumen;  
he used his own financial resources;  
and needed no help from external investors; [9 max]

6. (a) (i) *Award [1] for stating one aspect of the SPLAT Child's chair's manufacture which conforms to just-in-time (JIT) production.*  
it is made to order; [1]
- (ii) *Award [1] for each point in an outline of the SPLAT Child's chair in relation to radical and incremental design [2 max].*  
radical use of the postal tubes for the structure of the chair;  
but an incremental development of existing chair designs; [2]
- (iii) *Award [1] for each point in an outline of one reason for producing the SPLAT Child's chair in a range of colours for the seat only, rather than the entire chair [2 max].*  
consumer choice;  
so consumers can buy a chair with coloured seat which suits the environment of the room/the children;  
  
cost;  
to have a standard base component/it is more cost-effective to produce most parts of the chair in one colour (except for one component/the seat); [2 max]
- (b) (i) *Award [1] for defining quality control.*  
ensures that products/services are designed and produced to meet/exceed customer requirements/expectations; [1]
- (ii) *Award [1] for each point in an explanation of how the strategy design for materials has been a dominant constraint in the design brief for the SPLAT Child's chair [3 max].*  
materials choice/cardboard has been a major feature of the design brief for the chair;  
in order to satisfy a green design strategy;  
the designer has had to work within the constraints of the properties and characteristics of the material;  
  
the maximum size the laminated board can be manufactured;  
and the maximum length the cardboard tubes can be produced;  
will need to be taken into account by the designer; [3 max]
- (c) (i) *Award [1] for each point in an outline of the influence of planned obsolescence in the design of the SPLAT Child's chair [2 max].*  
the chair is aimed at 3–6 year old children;  
so children in a family setting will quickly outgrow the chair making it obsolete;  
  
the choice of materials for the chair/cardboard;  
is not a very hard wearing material and so will not last a long time;  
  
the chair is designed for use by small children;  
who will use the chair in a rough manner causing it to become broken/shabby; [2 max]

- (ii) Award **[1]** for each point in a discussion of three factors relating to ease-of-use for the SPLAT Child’s chair **[3 max]** per factor.

size;

the chair is not adjustable;

but 3–6 year olds represent a wide percentile range;

no sharp edges;

or finger traps;

and a smooth surface;

safety;

no arm rests;

so children will climb/fall on/off the chair;

stable product;

with a low centre of gravity;

and a sturdy appearance;

**[9 max]**