N14/4/DESTE/HP2/ENG/TZ0/XX/M

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

MARKSCHEME

November 2014

DESIGN TECHNOLOGY

Higher Level

Paper 2

13 pages

General Marking Instructions

Assistant Examiners (AEs) will be contacted by their team leader (TL) through Scoris™, by e-mail or telephone – if through Scoris™ or by e-mail, please reply to confirm that you have downloaded the markscheme from IBIS. The purpose of this initial contact is to allow AEs to raise any queries they have regarding the markscheme and its interpretation. AEs should contact their team leader through Scoris™ or by e-mail at any time if they have any problems/queries regarding marking. For any queries regarding the use of Scoris™, please contact emarking@ibo.org.

1. Follow the markscheme provided, award only whole marks and mark only in **RED**.

2. Make sure that the question you are about to mark is highlighted in the mark panel on the right-hand side of the screen.

3. Where a mark is awarded, a tick/check (✓) **must** be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark. **One tick to be shown for each mark awarded.**

4. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases use Scoris™ annotations to support your decision. You are encouraged to write comments where it helps clarity, especially for re-marking purposes. Use a text box for these additional comments. It should be remembered that the script may be returned to the candidate.

5. Personal codes/notations are unacceptable.

6. Where an answer to a part question is worth no marks but the candidate has attempted the part question, use the "ZERO" annotation to award zero marks. Where a candidate has not attempted the part question, use the "SEEN" annotation to show you have looked at the question. Scoris™ will apply "NR" once you click complete.

7. If a candidate has attempted more than the required number of questions within a paper or section of a paper, mark all the answers. Scoris™ will only award the highest mark or marks in line with the rubric.

8. Ensure that you have viewed **every** page including any additional sheets. Please ensure that you stamp "SEEN" on any additional pages that are blank or where the candidate has crossed out his/her work.

9. Mark positively. Give candidates credit for what they have achieved and for what they have got correct, rather than penalizing them for what they have got wrong. However, a mark should not be awarded where there is contradiction within an answer. Make a comment to this effect using a text box or the "CON" stamp.

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 ideas generating technique that stimulated the concept of the Wonderbag.*
constructive discontent; ***[1]***

(ii) *Award **[1]** for stating the purpose of using the thermoplastic (polystyrene) material in the construction of the Wonderbag.*
insulation; ***[1]***

(iii) *Award **[1]** for each distinct point in an outline of one limitation of the use of the Wonderbag for cooking most of a family's meals.*
it is only suitable for meals which contain much liquid *eg* stews;
most families want a wide variety of different types of meals/different types of cooking methods *eg* frying;

many family meals contain different food types which need to be cooked separately/for different amounts of time;
you would need more than one Wonderbag to cook these foods simultaneously;

some dishes require a long time for cooking;
significant advanced planning is needed; ***[2 max]***

(b) (i) *Award **[1]** for each distinct point in an outline of one maintenance consideration for the selection of the textile material for the Wonderbag.*
ease-of-cleaning;
food may spill onto the fabric so it must be washable;

seam might break open with wear;
and need re-stitching; ***[2]***

(ii) *Award **[1]** for each of two manufacturing techniques listed for producing the Wonderbag.*
cutting;
sewing / machining
printing/dyeing; ***[2]***

(c) (i) *Award **[1]** for stating one variable which may affect the data in Table 2.*
type of meals cooked;
paraffin costs may vary in a year;
users may vary cooking times compared to the data in Table 1; ***[1 max]***

(ii) *Award **[1]** for each distinct point in a discussion of one limitation of the use of the cooking times in Table 1 for the quality of the food cooked in the Wonderbag.*
the cooking times stated are estimates;
there are many variables which affect the cooking time required;
eg temperature of the room/how long left on the stove/left too long in the bag which will impact on the quality of food cooked; ***[3]***

(d) (i) *With reference to the company corporate objectives, award **[1]** for stating the amount of carbon which would be saved per home.*
3.4 tonnes; ***[1]***

(ii) *Award **[1]** for each distinct point in a discussion of one advantage for the multinational company, Unilever, of sponsoring the Wonderbag.*
company image;
helping to distribute the Wonderbag;
indicates corporate social responsibility;

advertising/marketing;
the company name becomes well known in communities;
and it is likely consumers will buy other products from the company range; ***[3 max]***

(e) (i) *Award **[1]** for each distinct point in an outline of one reason why the Wonderbag may be considered an example of appropriate technology.*
manufactured locally in African countries;
so creating 5000 jobs;

level of technology of Wonderbag is appropriate to the users;
they can effect repairs / maintain it more effectively;

Do not accept environmental issues ***[2 max]***

(ii) *Award **[1]** for each distinct point in an outline of one safety issue for the Wonderbag which may impact on the data for the reduction of accidents.*
users need to carry hot food in a heavy pan from the stove to the bag;
so they may spill hot food on themselves or others;

the stove still has to be used for cooking;
so it is another potential cause of accidents;

the Wonderbag is situated on the floor and left unattended;
so easy to trip over it/not realize it is a cooking bag;

pets may be attracted to the Wonderbag by the smell of the food;
and become injured when looking inside the bag for the food;

it cuts down on the use of paraffin;
this will improve the quality of the environment; ***[2 max]***

2. (a) *Award **[1]** for stating the main source of power for production prior to the Industrial Revolution.*
muscle/human power; ***[1]***

(b) *Award **[1]** for each distinct point in a discussion of the impact of steam power on the scale of production during the early stages of the Industrial Revolution.*
steam power increased the scale of production significantly;
it was more suitable for mechanization of the industry than water power;
it was more flexible and provided a consistent source of power (for a number of machines) / OWTTE; ***[3]***

3. (a) *Award **[1]** for each distinct point in a description of the difference between elastic and plastic strains.*
an elastic material returns to its original length when a load/stress is removed;
a plastic becomes deformed/elongated under load/stress; ***[2]***

(b) *Award **[1]** for each distinct point in a description of moment arm.*
the load × distance from the pivot is called the moment about the pivot;
the distance between the load and the pivot is called the moment arm;

the moment arm of a force system is the perpendicular distance from the axis to the line of action;
it determines the amount of torque; ***[2 max]***

4. (a) *Award **[1]** for stating the type of energy water has in a reservoir as part of a hydroelectric power system.*
potential; ***[1]***

(b) *Award **[1]** for each distinct point in a comparison of capital costs with manufacturing costs for a large hydroelectric power system.*
capital costs of construction of the system are very high;
because of the size of the dam required and type of machinery/technology;
but production costs are low as a continuous supply of water from a local source/river is available; ***[3]***

5. (a) *Award **[1]** for each distinct point in a description of the structure and bonding of thermoset plastic materials.*
linear chain molecules;
strong primary bonds between adjacent polymer chains; ***[2]***

(b) *Award **[1]** for each distinct point in an outline of why thermosetting plastics are suitable for compression moulding.*
compression moulding involves the use of high heat/pressure;
thermosets tolerate these conditions; ***[2]***

6. (a) *Award **[1]** for stating the type of mechanism used in lifting devices shown in Figure 3.*
ratchet (and pawl); ***[1]***

(b) *Award **[1]** for each distinct point in an explanation of how the design of the teeth in the mechanism shown in Figure 3 enable it to work efficiently.*
the teeth are shaped so that the pawl/arm engages with them easily;
it allows rotation in one direction only;
and so preventing a load running back down once it has been lifted; ***[3]***

SECTION B

7. (a) (i) *Award **[1]** for each distinct point in an outline of how the radical design of the Burgman Scooter will have contributed to high fixed costs.*
the radical aspect of the design relates to the use of new/fuel-cell technology;
this will have increased the research and development costs; ***[2]***

(ii) *Award **[1]** for each distinct point in an outline of the Burgman Scooter as an example of the corporate strategy of market development.*
there is an existing market for scooters;
but the Burgman scooter creates a new market for fuel-cell powered scooters; ***[2]***

(b) (i) *Award **[1]** for each distinct point in an outline of one reason why the appearance of the Burgman Scooter is similar to many other scooter models.*
to encourage consumer confidence;
that the scooter performs like other models;

Suzuki have an established track record of scooter designs;
it wants to capitalize on its image / market, but also respond to the demand for more environmentally friendly products;

the manufacturer may use some pre-existing components;
to reduce manufacturing costs; ***[2 max]***

(ii) *Award **[1]** for each distinct point in a discussion of one potential limitation of the increased use of hydrogen generated as an industrial by-product to fuel vehicles such as the Burgman Scooter.*
the hydrogen will need to be collected, processed and stored;
the distribution network to get the fuel to the users could be very large;
and the amount available from this type of source may be inadequate; ***[3]***

(c) (i) *Award **[1]** for each distinct point in an outline of one reason why an established company such as Suzuki wanted to collaborate with another company to design the Burgman Scooter.*
the use of hydrogen as a fuel source presented technological challenges to the designers;
Suzuki may not have the expertise/resources for the design development work; ***[2]***

(ii) *Award **[1]** for each distinct point in a discussion of three considerations for the consumer when deciding whether to purchase a Suzuki Burgman Hydrogen Scooter. Award **[3 max]** per consideration.*
availability of hydrogen fuel;
ease-of-use for filling the tank;
and performance of the scooter compared to traditional scooters;

consumer confidence;
safety of the fuel;
especially in an accident;

environmental benefit;
whether the reduction in carbon emissions;
is worth the energy used to process the hydrogen fuel;

consumers in parts of the world other than Europe;
are subject to different regulations;
which may not support the use of hydrogen as a fuel.

maintenance issues;
use of hydrogen is not common;
repair outlets may not have the confidence/skills to carry out repairs;

price of the fuel/scooter;
if it costs more than a conventional scooter/fuel;
consumers may not be able to afford it/find it cost-effective; ***[9 max]***

8. (a) (i) *Award **[1]** for each distinct point in a description of the type of mechanism used for the brake system of a bicycle.*
lever;
the rider presses a lever on the handlebars attached to a cable which activates the brakes to stop/slow the wheel; ***[2]***

(ii) *Award **[1]** for each distinct point in an outline of one maintenance consideration for the chain drive mechanism used on bicycles.*
the mechanism needs regular maintenance to ensure that it is well lubricated;
so that the chain interacts smoothly with the cogs and minimizes wear; ***[2]***

(b) (i) *Award **[1]** for each distinct point in a description of the type of load created by the rider on the bicycle*.
external;
the rider exerts a load by physical contact with the bicycle; ***[2]***

(ii) *Award **[1]** for each distinct point in a comparison of the design of the folding bicycle with a conventional non-folding bicycle in relation to product life.*
the folding bicycle contains more components compared to a conventional bicycle;
the mechanisms used to allow the Ventura bicycle to fold may become worn/break when used a great deal;
so reducing the product life compared to a non-folding bicycle; ***[3]***

(c) (i) *Award **[1]** for each distinct point in an outline of the permanent joining technique used to join parts of the metal frame of the bicycle.*
welding/brazing;
use of intense heat to fuse together metal resulting in a strong joint; ***[2]***

(ii) *Award **[1]** for each distinct point in a discussion of the benefits of the increased use of folding bicycles in relation to social, economic and environmental factors. Award **[3 max]** per factor.*
social benefits:
allows users to take bicycles on trains/in cars;
increasing opportunities for more cycling;
which is more healthy;

economic benefits:
users can reduce expenditure;
because the bicycle can be stored easily at work;
eliminating the need to use public transport/car to commute;

environmental benefits:
cycling instead of using cars;
minimizes use of energy sources;
and air/noise pollution; ***[9]***

9. (a) (i) *Award **[1]** for each distinct point in an outline of one reason for the relatively high price of the Ole chair.*
cutting of the holes to create the symmetry of the chair;
will be difficult to achieve requiring much abrading so expensive; ***[2]***

(ii) *Award **[1]** for each distinct point in an outline of one benefit of the design of the chair for portability.*
the numerous holes;
provide a variety of handholds to be able to carry the chair easily;

chairs are easily stackable;
a number can be carried at once; ***[2]***

(b) (i) *Award **[1]** for each distinct point in an outline of one advantage of using plywood for the chair in relation to strength-to-weight ratio.*
plywood is very strong due the plys/veneers laid perpendicular to each other and the amount of glue between each layer;
but the chair will be lightweight as the layers/veneers are thin; ***[2]***

(ii) *Award **[1]** for each distinct point in a suggestion of one limitation of the design of the Ole chair relating to ergonomics.*
width of the back;
shape of the back;
people with a very broad back may not sit comfortably;

degree of flexibility;
if the back is very stiff users may be uncomfortable;
especially if it is sat on for a long time; ***[3]***

(c) (i) *Award **[1]** for each distinct point in an outline of one potential safety issue for the design of the Ole chair.*
the holes could cause clothing to snag;
causing injury to users when moving out of the chair;

and plywood is prone to splintering at the edges;
especially over time as the finish may deteriorate; ***[2]***

(ii) *Award **[1]** for each distinct point in an explanation of three important quality control considerations for the manufacture of the Ole chair. Award **[3 max]** for each consideration.*
the numerous holes cut out of the plywood will create rough edges which need to be abraded well;
to ensure that the surface finish looks good/is safe;
and matches the quality of the surface finish of the seat;

the curved shape may cause the plywood layers/veneers to split/open;
especially once the glue dries out;
quality control checks need to ensure that the material is well bonded;

quality of the cutting of the holes needs to be checked;
so that they are of the correct size/shape;
and match symmetrically on each side of the chair; ***[9]***