88146205

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

DESIGN TECHNOLOGY
STANDARD LEVEL
PAPER 2

Candidate session number

Tuesday 18 November 2014 (afternoon)

1 hour

Examination code

8 8 1 4 – 6 2 0 5

INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is *[40 marks]*.

16EP01

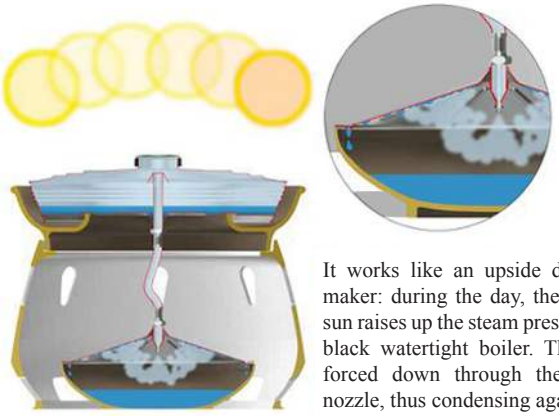
SECTION A

*Answer **all** questions. Write your answers in the boxes provided.*

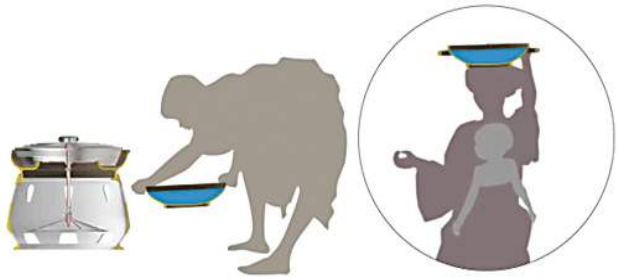
1. **Figure 1** shows the Eliodomestico household solar still which was designed by Gabriele Diamanti and developed between 2005 and 2012. The design is not protected so it can be freely adapted to take advantage of the availability of local materials and be manufactured on a small scale by local craftsmen. Diamanti's prototype was made from ceramics and metal sheet. The solar still does not use filters, is easy to maintain and can be used with sea water or dirty water. **Figure 2** shows a sequence of diagrams describing how the solar still works.

Figure 1: Eliodomestico household solar still

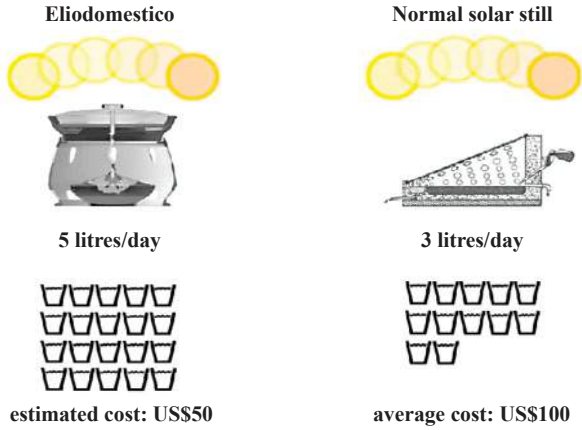
Figure 2: How the solar still works



It works like an upside down coffee maker: during the day, the heat of the sun raises up the steam pressure into the black watertight boiler. The steam is forced down through the expansion nozzle, thus condensing against the lid.



At the end of the day the **Eliodomestico** delivers 5 litres of fresh drinking water compared to 3 litres using a normal solar still. The lower basin is specifically designed for the transport over the head, supporting the common habit.



[Source: adapted from www.gabrielediamanti.com]

(This question continues on the following page)

(Question 1 continued)

(a) (i) State as a percentage how much more efficient the Eliodomestico is in generating drinking water than the normal solar still. *[1]*

. . . . . .
. . . . . .

(ii) State **one** raw material used for the ceramic parts of the Eliodomestico solar still. *[1]*

. . . . . .
. . . . . .

(iii) Outline why costs for the Eliodomestico still are stated as an estimate but costs for a normal still are stated as an average. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(This question continues on the following page)

(Question 1 continued)

(b) (i) Outline **one** way in which the Eliodomestico solar still satisfies **moral** responsibilities of the designer. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(ii) Outline **one** way in which the Eliodomestico solar still satisfies **social** responsibilities of the designer. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(c) (i) State **one** advantage of the Eliodomestico solar still not using filters. *[1]*

. . . . . .
. . . . . .

(ii) Explain **one** limitation of the capacity of the Eliodomestico solar still for providing the clean water needs of a family. *[3]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

2. (a) State **one** function of the glue in a composite matrix. *[1]*

. . . . . .
. . . . . .

(b) Explain why the technique of weaving is appropriate to manufacture composite materials. *[3]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

3. **Figure 3** shows part of the map for the London (UK) underground (tube) train system.

Figure 3: London underground map

[Source: www.tubehotels.com]

(a) State the type of model represented by the map. *[1]*

. . . . . .
. . . . . .

(b) Explain why the design of the map shown in **Figure 3** is a distorted representation of reality. *[3]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

SECTION B

*Answer **one** question. Write your answers in the boxes provided.*

4. **Figure 4** shows the Pure Twilight bedside radio/lamp with touch-sensitive controls. The lamp has a range of pre-set lighting options which can be combined with sound options such as chimes or waves and a light sensor adjusts the brightness of the display to suit the light levels of the room. The digital radio allows for 30 pre-set stations and 4 alarm settings. There is a headphone socket; power port for charging portable devices and USB accessories/iPod plug-in capability. **Figure 5** shows a close-up of the touch controls.

Figure 4: Pure Twilight bedside radio/lamp

[Source: www.pure.com]

Figure 5: Pure Twilight bedside radio/ lamp touch controls

[Source: http://www.trustedreviews.com]

(a) (i) Define *robust design.* *[1]*

. . . . . .
. . . . . .

(ii) Describe how the corporate strategy of product development, may have been used for the Pure Twilight radio/lamp. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(This question continues on the following page)

(Question 4 continued)

(iii) Describe how the designer of the Pure Twilight radio/lamp has attempted to balance form with function. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(b) (i) State **one** piece of anthropometric data important to the design of the Pure Twilight radio/lamp. *[1]*

. . . . . .
. . . . . .

(ii) Explain why perception is a key factor in the research phase of the Pure Twilight radio/lamp. *[3]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

(This question continues on the following page)

(Question 4 continued)

(c) (i) Describe the function of the light sensor for the Pure Twilight radio/lamp. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(ii) Discuss how performance testing, user trials and expert appraisal may have contributed to different stages of the design development of the Pure Twilight radio/lamp. *[9]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

5. **Figure 6** shows a small plate and bowl which are part of the Vegware range of tableware. The disposable products are made mainly from compositable bagasse. These particular plates are made entirely, not mainly, from bagasse. All Vegware products are compostable, not 'compositable'. Regarding mass customization: the bagasse range has very limited print options, but can be embossed. The products are more rigid than paper plates and bowls and are suitable for hot, wet and oily foods. The small plate costs UK£3.92 for a pack of 50 or UK£22.61 for a pack of 500 (2013).

Figure 6: Vegware plate and bowl

[Source: www.vegware.com]

(a) (i) State **one** reason why the company may wish to impose a minimum order for the Vegware tableware. *[1]*

. . . . . .

. . . . . .

(This question continues on the following page)

(Question 5 continued)

(ii) Outline the importance of density in the choice of materials for the Vegware tableware. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(iii) Outline **one** reason why the Vegware tableware may be suitable for mass customization. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(b) (i) Define *variable costs*. *[1]*

. . . . . .
. . . . . .

(ii) Compare design costs with research and development (R&D) costs for the Vegware tableware. *[3]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

(This question continues on the following page)

(Question 5 continued)

(c) (i) Describe the Vegware tableware as an example of the corporate strategy of market development. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(ii) Evaluate the environmental effects of the Vegware tableware in relation to the production, distribution and disposal stages of its product life cycle. *[9]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

Please **do not** write on this page.

Answers written on this page
will not be marked.

6. **Figure 7** shows the Eames DSW chair. It is known as the "Eiffel" chair after the Eiffel tower in Paris. The design is based on the original 1950s chair designed by Charles Eames which was considered innovative due to the use of a new composite, fibreglass, (glass fibres in a thermoset matrix) for the seat. Today the chair in **Figure 7** has hardwood (beech) legs, a thermoplastic (ABS) seat and metal supports. **Figure 8** shows detail of the metal frame of the chair.

Figure 7: Eames DSW chair

http://www.abode-interiors.co.uk/dining/dining-chairs/white-eames-dsw-chairs.html

Figure 8: Eames DSW chair metal frame

Please refer to the fifth image on this URL: http://www.abode-interiors.co.uk/office/white-eames-dsw-chairs.html .

(a) (i) State the manufacturing technique used to produce the thermoplastic seat of the chair in **Figure 7**. *[1]*

. . . . . .
. . . . . .

(ii) Outline the manufacturing technique used to join the metal supports to the legs of the Eames DSW chair. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(This question continues on the following page)

(Question 6 continued)

(iii) List **two** manufacturing techniques used to produce the hardwood legs of the chair in **Figure 7**. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(b) (i) State the product life cycle stage of the chair in **Figure 7**. *[1]*

. . . . . .
. . . . . .

(ii) Explain why the Eames DSW chair made with a thermoplastic seat is more cost-effective than the original Eames DSW chair design with the fibreglass seat. *[3]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

(This question continues on the following page)

(Question 6 continued)

(c) (i) Describe the Eames DSW chair as an example of robust design. *[2]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .

(ii) Discuss the design of the Eames DSW chair in relation to planned obsolescence, fashion and consumer perceptions of quality. *[9]*

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .