22126205

International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

**DESIGN TECHNOLOGY**
**STANDARD LEVEL**
**PAPER 2**

Candidate session number

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | | | | | |

Tuesday 8 May 2012 (afternoon)

1 hour

Examination code

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 1 | 2 | – | 6 | 2 | 0 | 5 |

INSTRUCTIONS TO CANDIDATES

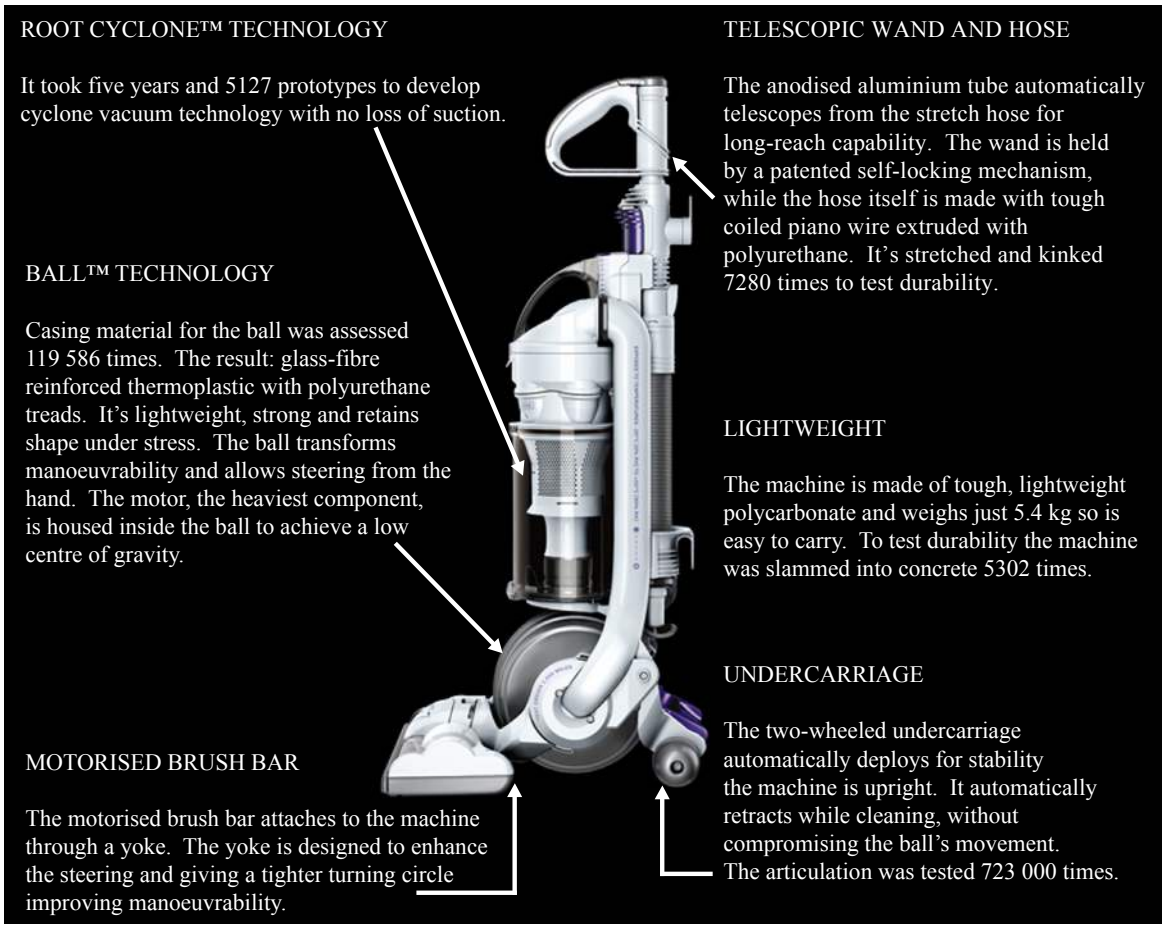
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination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

## SECTION A

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

**1.** **Figure 1** shows an advertisement for the Dyson DC24 DRAWING Limited Edition vacuum cleaner. The DC24 DRAWING is a special version of a range of vacuum cleaners that use ball technology to make them easier to steer across floors. Dyson first used ball technology for his re-design of a wheelbarrow in which a plastic ball replaced a traditional front wheel making the wheelbarrow easier to manoeuvre over uneven surfaces in the garden. **Figure 2** shows an enlarged view of the hose component.

**Figure 1: Dyson DC24 DRAWING Limited Edition vacuum cleaner**




[Image reproduced by permission of Dyson Limited.]

*(This question continues on the following page)*

*(Question 1 continued)*

**Figure 2: Hose for Dyson DC24 DRAWING Limited Edition vacuum cleaner**

[Image reproduced by permission of Dyson Limited.]

(a) (i) State which material category the material used for the ball belongs to. *[1]*

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

(ii) State **one** reason for using polyurethane with the metal piano wire for the hose. *[1]*

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

(iii) Describe the extrusion process used to manufacture the hose. *[2]*

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

*(This question continues on the following page)*

*(Question 1 continued)*

(b) (i) Outline **one** reason why Dyson chose a transparent material for the casing for the dust container. *[2]*

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

(ii) Outline the ideas generating technique used by Dyson for designing the ball technology aspect of the vacuum cleaner. *[2]*

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

(c) (i) State the strategy used for evaluating the durability of the cleaner. *[1]*

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

*(This question continues on the following page)*

*(Question 1 continued)*

(ii) Explain why the number of tests used for different components of the vacuum cleaner varies. *[3]*

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

**2.** (a) State **one** issue relating to timber as a renewable resource. *[1]*

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

(b) Discuss the use of particle board (chipboard) for a student's desk in relation to planned obsolescence. *[3]*

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

**3.** (a) State the manufacturing technique used to create glass bottles. *[1]*

. . . . . .

. . . . . .

(b) Explain how the composition of Pyrex® glass has been determined in order to make it successful in the marketplace. *[3]*

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

## SECTION B

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

**4.** **Figure 3** shows shoes made by the company Terra Plana. The traditional shoe-making industry is not usually environmentally-friendly as: chemicals are used for treating leather; glues are toxic; the process of manufacture is energy intensive. Where possible the parts of the Terra Plana shoe are stitched together rather than glued but if gluing is necessary then water-based glue is used and all dyes are non toxic. However, some shoes feature a lightweight, glueless, changeable sole. The material used for the inner lining of the shoe is made from recycled plastic bottles.

**Figure 3: Terra Plana shoes**


[www.brandish.tv/2009/04/22/yukam-vivo-barefoot-shoe-by-te.html]

(a) (i) State the percentile range used to decide the range of shoe sizes. *[1]*

. . . . . .

. . . . . .

*(This question continues on the following page)*

*(Question 4 continued)*

(ii) Outline **one** issue in using the percentile range stated in (a) (i) for the international marketplace. *[2]*

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

(iii) Outline **one** reason why plastic bottles are suitable for recycling. *[2]*

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

(b) (i) State **one** way in which the design of the Terra Plana shoe is consistent with clean manufacturing. *[1]*

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

*(This question continues on the following page)*

*(Question 4 continued)*

(ii) Compare stitching with gluing for joining shoe parts in relation to product life cycle. *[3]*

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

(c) (i) Outline **one** way in which design for manufacture (DfM) has been a dominating constraint on the design brief for the Terra Plana shoe. *[2]*

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

*(This question continues on the following page)*

*(Question 4 continued)*

(ii) Discuss the concepts of reuse, repair and recycling in relation to the Terra Plana shoes. *[9]*

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

Answers written on this page
will not be marked.

**5.** **Figure 4** shows the Yogo – an electric scooter manufactured by Econogo and designed in a 1960s retro style. The idea for the Yogo came from James South after he left university looking for a business opportunity. South wanted to buy a scooter to travel around London. He was impressed by the electric cars on the market and wanted an electric scooter but the ones available worked on lead-acid batteries. South obtained enough funds to develop the Yogo which uses a 50V lithium battery. Lithium batteries are more expensive than lead-acid batteries but are more environmentally-friendly, lighter and can be easily removed from the scooter. The Yogo has a top speed of 50 km $h^{-1}$ and a range of 22 miles before it needs recharging. Charging takes one hour and costs a fraction of the cost of using petrol (gas). Since the launch of the Yogo in 2010 other companies have developed similar products. The Yogo costs three times as much as a conventional petrol scooter.

**Figure 4: Yogo electric scooter**

[Source: http://www.econogoelectricscooters.co.uk/product.php/2/0/Yogo. Used with permission]

(a) (i) Define *market sector*. *[1]*

. . . . . .

. . . . . .

*(This question continues on the following page)*

*(Question 5 continued)*

(ii) Outline how the Yogo satisfies a pioneering corporate strategy. *[2]*

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

(iii) Outline **one** advantage of the Yogo's battery being easily detached other than for re-charging. *[2]*

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

(b) (i) State the scale of production for the Yogo. *[1]*

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

*(This question continues on the following page)*

*(Question 5 continued)*

(ii) Explain why the designer decided to use retro-styling for the scooter. *[3]*

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

(c) (i) Outline **one** way in which assembly line production for the Yogo contributes to cost-effectiveness. *[2]*

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

*(This question continues on the following page)*

*(Question 5 continued)*

(ii) Discuss the roles of inventor, innovator and entrepreneur in relation to James South's contribution to the evolution of the Yogo scooter. *[9]*

**6.** **Figure 5** shows a wooden bureau (writing desk) designed by Toby Winteringham. The bureau is made mainly from the hardwood, oak, and the surface decoration is marquetry. Marquetry is a highly skilled hand technique where patterns are cut by hand into the surface of the oak to match the shape of coloured veneers which are then glued in place so they lie smooth with the surface of the oak. **Figure 6** shows the bureau opened up. The bureau costs approximately £4500 (6000 USD).

**Figure 5: Wooden bureau**

**Figure 6: The fold-down shelf acts as a writing desk**

[Used with permission.]

(a) (i) State the percentile used to decide the distance between the floor and the height of the shelf. *[1]*

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

(ii) Outline **one** anthropometric consideration in deciding the depth of the fold down shelf. *[2]*

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

*(This question continues on the following page)*

*(Question 6 continued)*

(iii) Outline **one** psychological ergonomic factor relating to the bureau. *[2]*

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

(b) (i) State the most likely scale of production for the bureau. *[1]*

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

(ii) Discuss the contribution of craft production and mechanisation for the manufacture of the bureau. *[3]*

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

*(This question continues on the following page)*

*(Question 6 continued)*

(c) (i) Outline **one** reason for the high cost of the bureau. *[2]*

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

(ii) Discuss **three** ways in which the designer has attempted to balance form with function in the design of the bureau. *[9]*

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

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

Answers written on this page
will not be marked.

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

Answers written on this page
will not be marked.

2020