22106205

International Baccalaureate®
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DESIGN TECHNOLOGY
STANDARD LEVEL
PAPER 2

Wednesday 12 May 2010 (afternoon)

1 hour

Candidate session number

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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 of Section A in the spaces provided.
- Section B: answer one question from Section B. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

0107

SECTION A

*Answer **all** the questions in the spaces provided.*

1. A designer has developed a prototype and is considering whether it has the potential to be turned into an innovation. A manufacturer has given the designer an estimate of production costs (see **Figure 1**). Market research suggests that at a retail price of US$150 the designer could aim to sell about 1000 products a year.

The retailer expects to make a profit of 40 % of the selling price of each product.

If the product is successful the designer intends to continue to develop the product with a revised version at a later date.

Figure 1: Estimated manufacturing costs

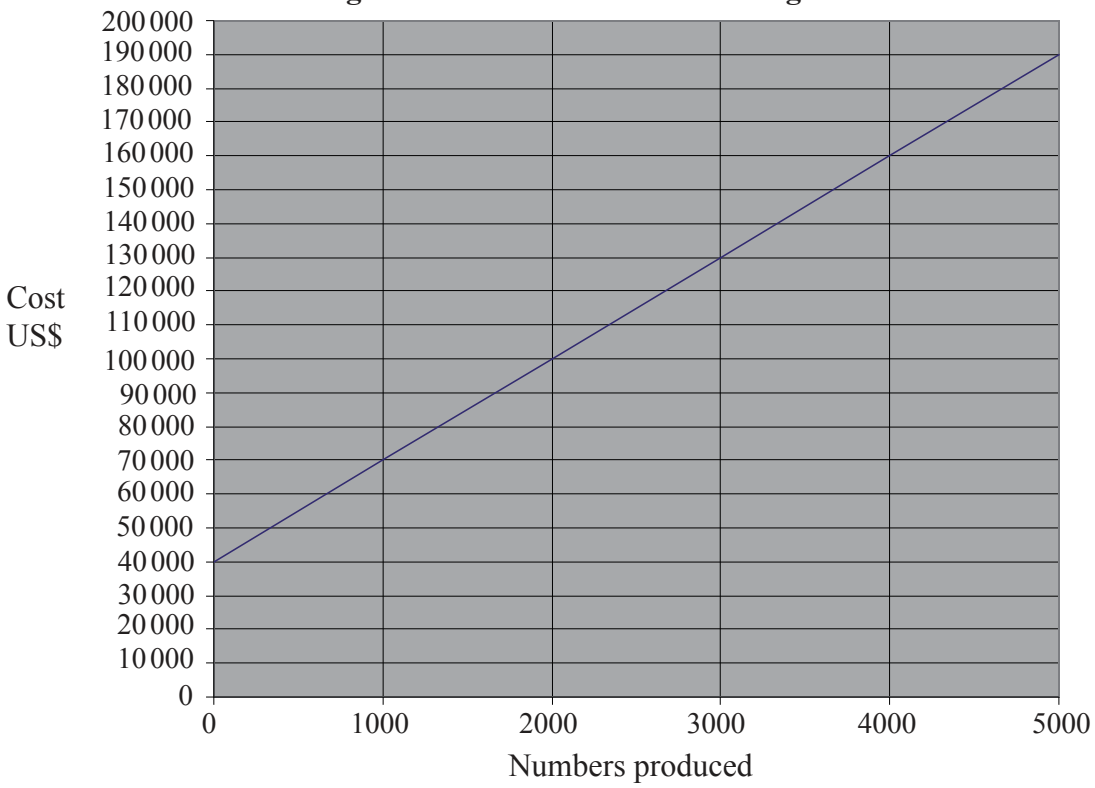

Table 1: Fixed costs (US$)

Research design and development	6000
New equipment and tooling	16 000
Market research and product launch	18 000

(This question continues on the following page)

(Question 1 continued)

(a) (i) State the total fixed costs. *[1]*

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(ii) Calculate the cost per product if 2000 are produced. *[2]*

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(iii) Calculate the potential profit per item for the designer if 2000 products were produced. *[3]*

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(b) (i) Outline the corporate strategy likely to be used for a revised version of the product. *[2]*

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(ii) State which cost would **not** be incurred if a design for manufacture (DfM) strategy were adopted for the redesign of the product. *[1]*

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(iii) Suggest a market research strategy the designer may use to inform the development of the revised version. *[3]*

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2. (a) Define *plastic deformation*. *[1]*

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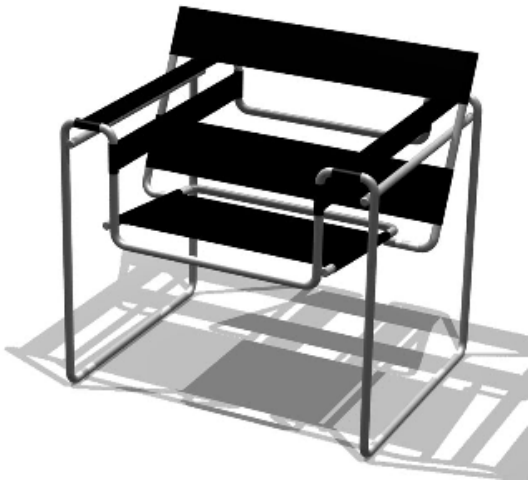
(b) Explain the importance of plastic deformation in the use of metal tubing for the tubular metal chair shown in Figure 2. *[3]*

Figure 2: Mart Stam tubular metal chair



[Source:http://en.wikipedia.org/wiki/File:Bauhaus_Chair_Breuer.png]

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3. (a) Define *automation*. *[1]*

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(b) Compare mass customization with craft production. *[3]*

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SECTION B

*Answer **one** question. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.*

4. **Figure 3** shows the Wiggle Side chair designed by Frank Gehry and manufactured by the furniture company Vitra. It is made from cardboard and is available in a natural finish or a limited range of colours. The surface is lacquered which makes it non-porous and smooth.

Figure 3: The Wiggle Side Chair

[Source: Gehry Partners, LLP. Used with permission]

(a) (i) State the scale of production most likely for the Wiggle Side chair. *[1]*

(ii) Outline **one** reason for the scale of production stated in response to question (a) (i). *[2]*

(iii) Outline **one** reason for producing the chair in a limited colour range. *[2]*

(b) (i) State the percentile used to determine the height of the seat from the floor. *[1]*

(ii) Explain **one** physiological factor affecting the ergonomics of the chair. *[3]*

(c) (i) Outline **one** performance test that could be used to ensure the chair is suitable for users. *[2]*

(ii) Discuss **three** issues for the designer in attempting to balance form with function for the Wiggle Side chair. *[9]*

5. **Figure 4** shows the Bic Cristal ballpoint pen which was originally invented by Ladislao Biro in 1938. The pen was patented and volume produced by Marcel Bich in 1946. Since then the pen has become an inexpensive global product. It is regarded as a design classic and is part of the permanent collection of the Museum of Modern Art in New York. The barrel of the pen is made from polystyrene, the cap from polypropylene, the ball from tungsten carbide metal and the writing tip from a metal alloy of brass/nickel. The pen is produced in four colours – blue, green, black and red.

Figure 4: The Bic Cristal pen

[Photo: Trounce/Wikimedia Commons]

(a) (i) State **one** physical property important for the choice of material for the tip of the pen. *[1]*

(ii) Outline **one** reason for the choice of polypropylene for the cap related to the scale of production of the pen. *[2]*

(iii) Outline **one** possible reason why, as a lone inventor, Ladislao Biro failed to make his invention into an innovation. *[2]*

(b) (i) State **one** reason for designing the barrel of the pen to be transparent. *[1]*

(ii) Explain **one** ergonomic consideration for designing the barrel of the pen with flat surfaces. *[3]*

(c) (i) Outline **one** way in which the pen in Figure 4 contributes to planned obsolescence. *[2]*

(ii) Suggest **three** reasons why the Bic Cristal pen is considered a design classic. *[9]*

6. **Figure 5** shows the *Spence Tape Dispenser* on sale from the company Umbra. It differs from the design of a conventional tape dispenser as the designer has not used a turn wheel to hold the tape with side supports. Instead the tape is suspended in the middle of the metal block. A blade to cut the tape is set in a groove on the top of the block which is made from polished metal alloy to provide a reflective surface.

Figure 5: The Spence Tape dispenser

[Source: Umbra (www.umbra.com). Designed by Adin Mumma. Reproduced with permission]

(a) (i) State the manufacturing technique used to produce the body of the tape dispenser. *[1]*

(ii) Outline the importance of density in choosing the material for the tape dispenser. *[2]*

(iii) List **two** features of the tape dispenser which are most likely to have been produced by CAM. *[2]*

(b) (i) State **one** reason why the design of the tape dispenser may satisfy a green design strategy. *[1]*

(ii) Explain the relationship of form with function to the design of the oval hole in the top surface of the tape dispenser. *[3]*

(c) (i) Outline **one** safety aspect of the tape dispenser. *[2]*

(ii) Explain **three** strategies that could be used on a prototype of the tape dispenser as part of the testing and evaluating stage of the design cycle. *[9]*