



22146202

**DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 2**

Candidate session number

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Monday 19 May 2014 (afternoon)

1 hour 45 minutes

Examination code

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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 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 *[60 marks]*.



20EP01

SECTION A

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

1. **Figure 1** shows the Lifedge iPad waterproof case produced by the company Scanstrut. It protects an iPad without interfering with its functions and is targeted at the market for watersports. The case cost UK£200 000 to bring to market and sells for approximately UK£100. An iPhone case is planned for the future. **Table 1** shows data for the iPad case. **Table 2** (on page 5) shows instructions for fitting the iPad case to an iPad.

Figure 1: Lifedge iPad case

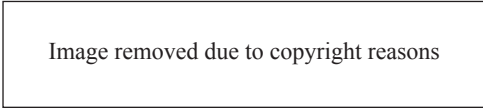


Table 1: Data for the iPad case

A rectangular box containing the text "Table removed due to copyright reasons" and a source URL: "[Source: <http://www.lifedge.co.uk/product/waterproof-case-for-ipad-1>]".

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(Question 1 continued)

- (a) (i) State **one** reason for producing the case in bright colours. [1]

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- (ii) State **one** way that the corporate strategy of diversification has been used for the design of the case. [1]

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- (iii) Describe the case as part of a product family. [2]

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- (b) (i) Outline why the case may not be waterproof if left in water at a greater depth than one metre. [2]

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(Question 1 continued)

- (ii) Outline which fixed costs are likely to be the highest for the case. [2]

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- (c) (i) State the evaluation strategy for the shockproof test. [1]

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- (ii) Explain the limitations of the strategy of the shockproof test in terms of the product life cycle of the iPad. [3]

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(Question 1 continued)

Table 2: Instructions for fitting the iPad case to the iPad



- (d) (i) State the manufacturing technique that would be used to produce the case. [1]

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- (ii) Explain **one** disadvantage of the test to check the waterproof seal. [3]

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(Question 1 continued)

- (e) (i) Outline **one** potential safety issue for the users when fitting the case. [2]

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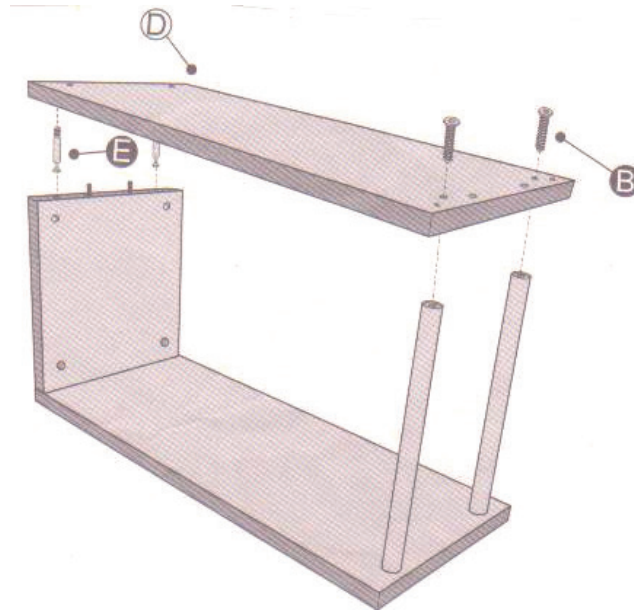
- (ii) Outline **one** reason why some people might not be able to fit the case correctly even though they understand the instructions. [2]

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2. **Figure 2** shows part of the assembly instructions included with a flat-pack self-assembly wall unit manufactured by a multinational company.

Figure 2: Flat-pack self-assembly wall unit



[Source: Geneva 6 Shelf Unit Assembly Instructions by Homebase LTD.]

- (a) State the type of drawing shown in **Figure 2**. [1]

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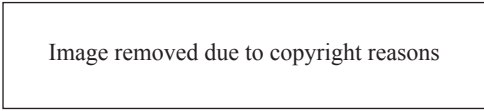
- (b) Discuss **one** advantage of this type of drawing for the consumer. [3]

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3. **Figure 3** shows a diagram of the blow moulding process for a plastic bottle.

Figure 3: A diagram of the blow moulding process



(a) Describe the type of polymer chain in the plastic used for the bottle. [2]

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(b) Describe the function of the mandrel in the blow moulding process. [2]

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4. **Figure 4** shows the Swift micro wind turbine.

Figure 4: A Swift micro wind turbine



[Source: www.renewabledevices.com. Used with permission.]

(a) State which product life cycle stage applies to the wind turbine in **Figure 4**. [1]

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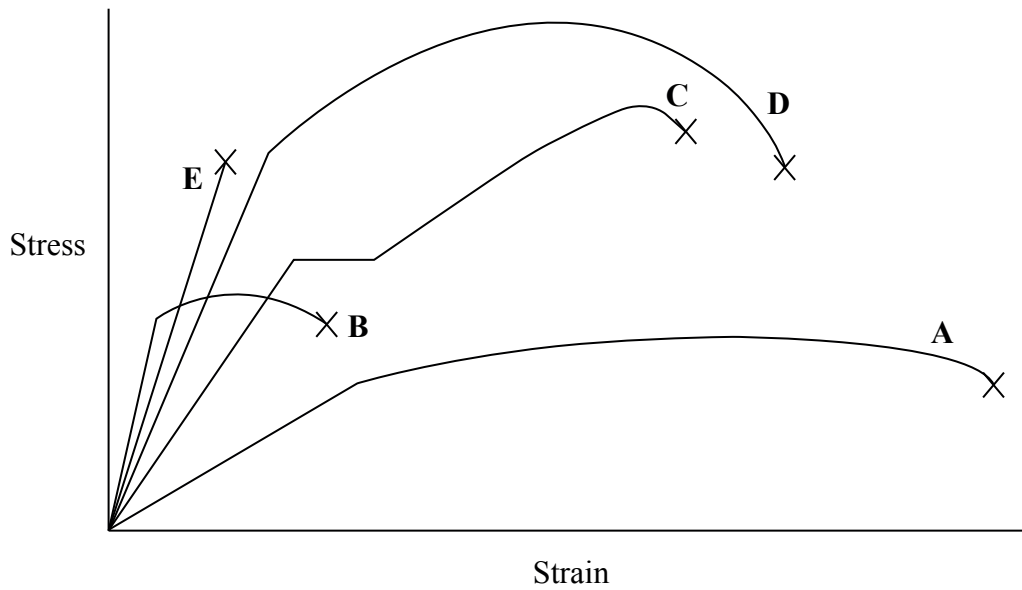
(b) Explain **one** limitation of the wind turbine for the local environment. [3]

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5. Figure 5 shows the stress/strain graph for five different materials A–E.

Figure 5: Stress/strain graph for five different materials A–E



[Source: © International Baccalaureate Organization 2014]

(a) Outline which material is the strongest.

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(b) Outline which material is the stiffest.

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6. (a) State how “end-of-pipe” relates to clean manufacturing. [1]

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- (b) Explain **one** reason why many manufacturers may take an incremental approach to the adoption of clean technology. [3]

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SECTION B

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

- 7. **Figure 6** shows a version of the Versatile Ladder. It quickly converts from a straight ladder to an A-frame stepladder or a five-position scaffolding platform and extends to 4.75 m. The ladder frame is made from a non-ferrous metal and the platform from steel. The ladder is designed to withstand a load of 136 kg but is light enough to be carried and folds to fit into a standard car boot (trunk). The ladder has multi-lock hinges at the joints that lock into nine different positions. It has rubber feet and comes with a 10 year guarantee. It costs approximately US\$150.

Figure 6: Versatile Ladder



[Source: www.shop.express.co.uk]

- (a) (i) Outline **one** reason for designing the ladder with rubber feet. [2]

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(Question 7 continued)

- (ii) Outline the importance of density in the selection of materials for the ladder. [2]

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- (b) (i) Outline **one** reason for using the non-ferrous metal for the Versatile Ladder in relation to product life cycle. [2]

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- (ii) Explain how the manufacturer of the Versatile Ladder has taken into account quality control and quality assurance measures. [3]

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(Question 7 continued)

- (c) (i) Outline which component of the Versatile Ladder is most likely to reduce the life cycle of the product. [2]

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- (ii) Discuss **three** ways in which the designer has considered external loads in the design of the Versatile Ladder. [9]

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8. **Figure 7** shows a treated steel wire table and stool. They were designed by Stephen Burks and are available in white, black or red. The furniture is craft produced by weaving the steel wire onto a rigid steel frame. The 90 cm diameter table is available for approximately US\$550 and the stool for US\$172.

Figure 7: Treated steel wire table and stool



[Source: www.artecnica.com. Used with permission. Designed by Stephen Burks and produced with the help of South African artisans Feeling African.]

- (a) (i) Outline the technique used for joining the components of the steel frame. [2]

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- (ii) Outline the manufacturing technique used for creating metal wires. [2]

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(Question 8 continued)

- (b) (i) Outline **one** maintenance issue for this type of furniture. [2]

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- (ii) Explain how the strategy of product development could be used to create a design family of the stools. [3]

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(Question 8 continued)

- (c) (i) Outline **one** potential safety issue for the use of this type of furniture in a family home. [2]

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- (ii) Discuss how the designer has taken into account the properties of tensile strength, stiffness and toughness in the design of this type of furniture. [9]

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9. **Figure 8** shows the Natural House, an environmentally friendly home in the UK, built by the Prince’s Foundation for Building Community. The house utilizes natural, locally-available materials, traditional building crafts and local labour. The roof is made from clay tiles and along with the floors, is insulated with sheep’s wool. The walls are made of clay blocks with a honeycomb structure (**Figure 9**). The house is designed with high ceilings and large triple-glazed windows that allow a large amount of daylight into the building.

Figure 8: The Natural House



[Source: Courtesy of The Prince’s Foundation for Building Community]

Figure 9: Clay blocks with a honeycomb structure



[Source: www.ziegelwerk-bellenberg.de. Used with permission.]

- (a) (i) List **two** specifications of the Natural House that conform to the criteria for appropriate technology. [2]

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(Question 9 continued)

- (ii) Outline **one** way in which maximizing daylight contributes to the objectives of a low-carbon house. [2]

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- (b) (i) Outline **one** reason why clay is a suitable material for the roof tiles. [2]

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- (ii) Suggest why the design of the clay blocks for the walls helps to reduce heat loss. [3]

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(Question 9 continued)

- (c) (i) Outline **one** reason why the use of sheep's wool is cost-effective as an insulation material for the floors and roof. [2]

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- (ii) Explain how the Natural House satisfies the three categories of triple bottom line sustainability. [9]

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