

88056203

**DESIGN TECHNOLOGY
HIGHER LEVEL
PAPER 3**

Tuesday 8 November 2005 (morning)

1 hour 15 minutes

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.
- Answer all of the questions from two of the Options in the spaces provided. You may continue 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 letters of the Options answered in the candidate box on your cover sheet and indicate the number of answer sheets used in the appropriate box on your cover sheet.



Option D — Food technology

D1. An ice cream making machine (see **Figure D1**) can be used to produce fresh homemade ice cream in different flavours, e.g. banana ice cream. The bowl is placed overnight in a deep freezer. The ingredients (cream, milk, eggs, sugar, salt, vanilla extract and bananas) are blended together, added to the machine and aerated by churning the mixture until it is smooth and frozen. When the ice cream is ready, the bowl is detached from the motor unit and the ice cream served.

Figure D1: An ice cream making machine



(a) Outline **one** lifestyle factor that is likely to contribute to the popularity of ice cream making machines as domestic appliances. [2]

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(b) Describe what causes browning of bananas during food preparation. [2]

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(Question D1 continued)

- (c) List **two** pieces of information that would be included on the label for a commercial ice cream. [2]

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- D2.** Describe how the process of aeration during the churning process affects the physical properties of ice cream. [2]

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- D3.** Explain how health awareness might influence the selection of **one** ingredient used in ice cream manufacture. [3]

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Option E — Computer-aided design, manufacture and production

E1. CAD software, e.g. *Pro/DESKTOP*, can be used to develop designs as well as to produce accurate orthographic drawings. CAD can also be interfaced to CAM to produce a CAD/CAM system. The images below were produced using *Pro/DESKTOP* software: **Figure E1** shows the body of the car; **Figure E2** shows the rear wheel; **Figure E3** shows the front wheel; **Figure E4** shows the model car assembled from the body parts (two rear wheels, two front wheels and a body).

Figure E1: Body

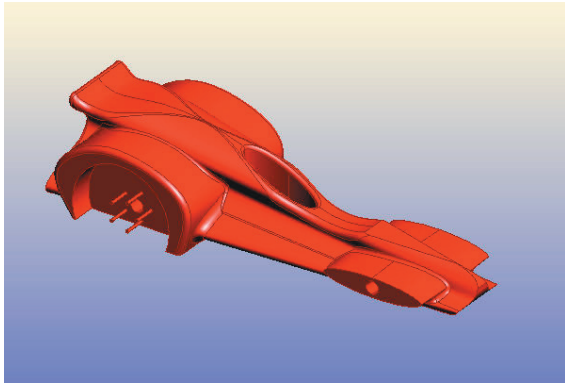


Figure E2: Rear wheel

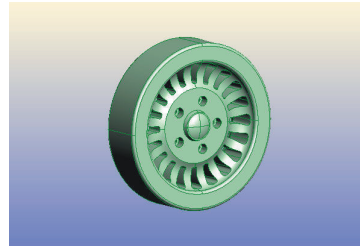


Figure E3: Front wheel

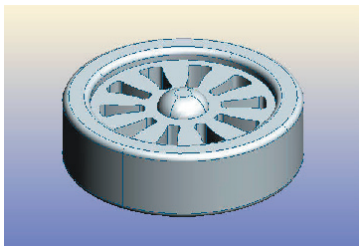
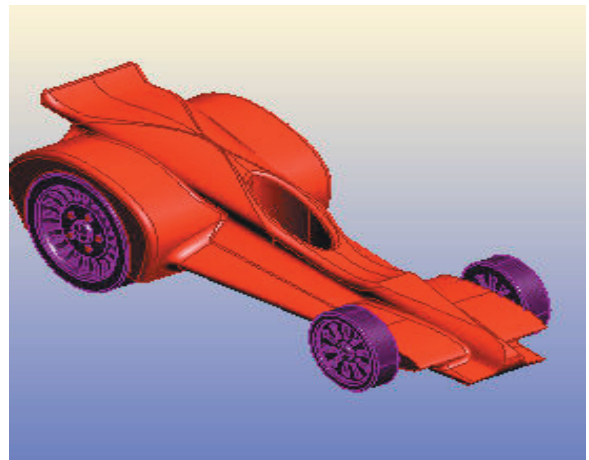


Figure E4: Assembled product



(a) State **one** example of an input device and **one** example of an output device that would be used with the CAD software in the development of the model car. [2]

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(b) List **two** benefits of computer modelling of the model car. [2]

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(Question E1 continued)

- (c) Outline **one** advantage for the designer of using a 3-D solid modelling package, such as Pro/DESKTOP. [2]

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- E2.** Describe how CAD is interfaced with other pieces of equipment to provide a CAD/CAM system. [2]

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- E3.** Explain how mass customisation of the model car could benefit the consumer. [3]

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E4. Explain **three** reasons why a company would consider Design for Manufacture (DfM). [9]

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Option F — Invention, innovation and design

F1. **Figure F1** shows the “Lotus Bicycle” invented by “lone inventor”, Mike Burrows and developed further by Lotus Engineering. Lotus has a reputation for manufacturing high quality sports cars so diversifying into bicycle manufacture was a new challenge for the company.

It was first shown to the public in 1992 at the Barcelona Olympics. The bicycle frame is manufactured from carbon fibre.

Figure F1: Lotus Bicycle



F1. (a) State **one** feature of the design of the Lotus bicycle which has resulted from technology push. [1]

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(b) Explain why producing the Lotus bicycle can be considered a pioneering corporate strategy for Lotus Engineering. [3]

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F2. (a) Outline **one** reason why many governments promote cycling as part of a pro-active environmental policy. [2]

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(b) Explain **one** way in which the design of the bicycle frame does not satisfy the criteria for a pro-active environmental policy. [3]

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F3. Outline **one** characteristic of a lone inventor. [2]

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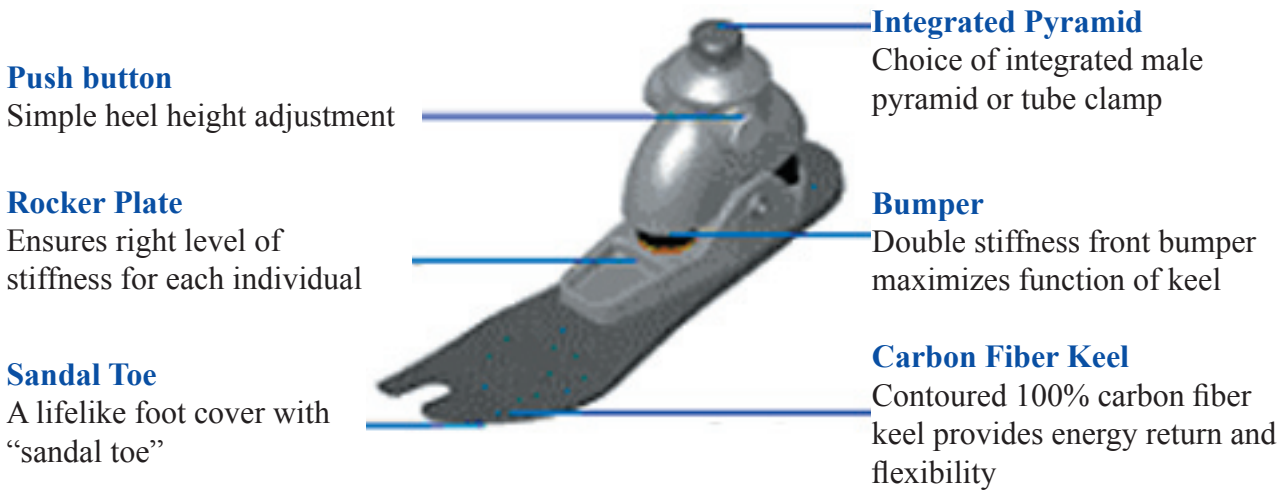
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Option G — Health by design

G1. The use of the internet now enables amputees (*i.e.* people who have had one or more limb removed by amputation) to check what products are available and to make appropriate choices to suit their needs. **Figure G1** is an annotated prosthetic foot that is available for amputees. User-centred design is an important element in the design of prostheses.

Figure G1: Prosthetic foot



[Source: adapted from www.osur.com]

(a) Define *prosthesis*. [1]

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(b) Explain why user-centred design is an important element in the design of prostheses. [3]

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G2. Outline **one** technology from the example in Figure G1 which illustrates the opportunities for individualization of product design. [2]

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G3. Allografts have been used to grow new skin on burns victims. Distinguish between an allograft and an autograft. [2]

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G4. Explain how the location in which a hearing aid is worn can suit an individual's lifestyle. [3]

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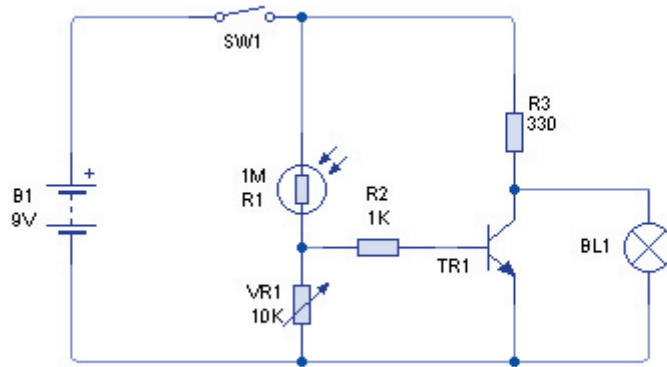
Option H —Electronic products

H1. An automatic wall light for a young person’s bedroom is shown in **Figure H1**. The circuit diagram for the electronics which control the light is shown in **Figure H2**.

Figure H1: A young person’s bedroom wall-light



Figure H2: The circuit for the bedroom light

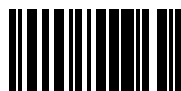


(a) State the name of the component labelled as R1 in Figure H2. [1]

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(b) Describe the joint function of the components shown as R1 **and** VR1 in Figure H2. [2]

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H2. (a) Explain how a systems approach could be applied to designing the circuit shown in Figure H2. [3]

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(b) The circuit in Figure H2 shows a low voltage bulb being switched on as the system's output. State how the circuit would be modified so that an LED could be used as the output device instead of the bulb. [1]

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(c) Describe the purpose of the component labelled as TR1 in Figure H2. [1]

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H3. Outline how Peripheral Interface Controllers (PICs) could be used to speed development time in the design of an INPUT-PROCESS-OUTPUT circuit. [2]

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H4. Define *programmable system*. [1]

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