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Design technology
Higher level
Paper 3

9 May 2024

Zone A morning | **Zone B** morning | **Zone C** morning

Candidate session number

1 hour 30 minutes

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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.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[40 marks]**.



Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

1. MarinaTex, by Lucy Hughes, is a compostable material designed as an alternative to single-use plastic films. The material is comprised of waste material from the fishing industry and sustainable algae, see **Figure 1** and **Figure 2**.

Figure 1: Waste products from the fishing industry



Figure 2: MarinaTex in sheet form



(This question continues on the following page)



(Question 1 continued)

MarinaTex is stronger than polyethylene (PE), making it an ideal home-compostable alternative to plastic packaging such as food bags and sandwich packs, see **Figure 3**.

Figure 3: MarinaTex used as part of a pastry bag, sandwich and tissue box



50 million tonnes of waste is produced annually by the global fishing industry. MarinaTex biodegrades naturally in 4–6 weeks, making it ideal for applications in packaging. The material is regarded as low tech, low cost and does not require much energy to produce.

As MarinaTex uses waste from the fishing industry, it helps close the loop for a more circular design and is part of a waste stream which reduces strain on resources and diverts waste from landfill.

(This question continues on the following page)



12EP03

Turn over

(Question 1 continued)

- (a) Triple bottom line sustainability addresses the values and criteria for measuring organizational success.

List **two** attributes of triple bottom line sustainability in relation to MarinaTex material. [2]

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- (b) Outline **one** type of consumer MarinaTex would appeal to. [2]

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- (c) Outline **one** market research strategy that could be used to determine if there was a market for MarinaTex. [2]

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(This question continues on the following page)



(Question 1 continued)

(d) Promotion is one of the four Ps in the marketing mix.

Explain the importance of promotion in helping consumers to become aware of MarinaTex as an alternative to plastic packaging.

[4]

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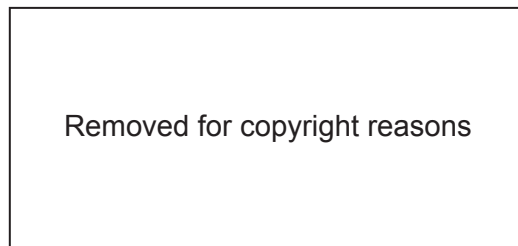
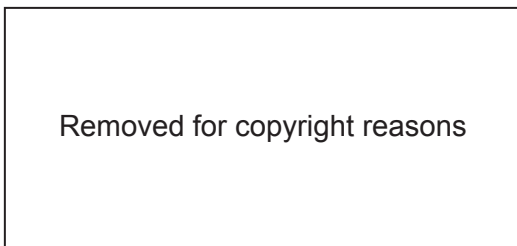
Turn over

- 2. Sportswear brand Nike created the GO FlyEase shoe, which can be put on and taken off without using your hands replacing the need for traditional laces.

The GO FlyEase is made of two sections connected by a tensioning band and hinge allowing users to put them on and take them off without using any fastening, making them completely hands-free.

Combined with a large rubber band, the hinge allows the shoe to be secure in both an open position for the foot to enter, and a closed position for when the shoes are in use, see **Figure 4**.

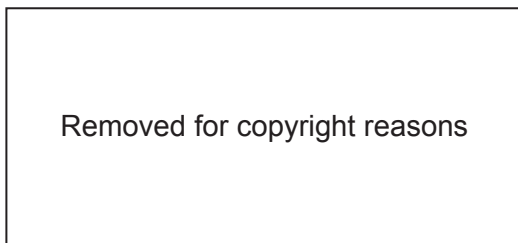
Figure 4: Nike GO FlyEase shown open and closed



The shape of the shoe makes it very easy to slip into and out of using a stable hinge within the sole, see **Figure 5** and **Figure 6**.

Figure 5: Shoe heel showing tensioner band and stable hinge

Figure 6: Removing the shoe without the use of hands



The shoes are designed to address human behaviour and be intuitive to use, as the process is similar to the way people slide into shoes and then kick them off.

Although designed as an everyday shoe, Nike believes that it can be used by groups of people who find it difficult to put their shoes on.

(This question continues on the following page)



(Question 2 continued)

- (a) Outline how the Nike GO FlyEase could be regarded as an inclusive design. [2]

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- (b) Outline **one** benefit of the enhanced usability of the Nike GO FlyEase. [2]

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- (c) Outline how prototype testing sessions **and** usability testing sessions could be used at the design development stage of the Nike GO FlyEase. [6]

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Section B

Read the case study. Answer the following question. Answers must be written within the answer boxes provided.

3. CAKE is a Swedish electric bike company with a goal to develop high-quality, sustainable performance products. CAKE believes that the use of electric drivetrains (power to drive the wheels) in their production system can bring positive change to the future of motorbikes.

CAKE's bikes are lightweight, quiet and designed to promote performance on trails. The design, construction and careful use of materials make for an agile and powerful riding experience, see **Figure 7** and **Figure 8**. CAKE's bikes also have zero carbon emissions.

Figure 7: Kalk OR model

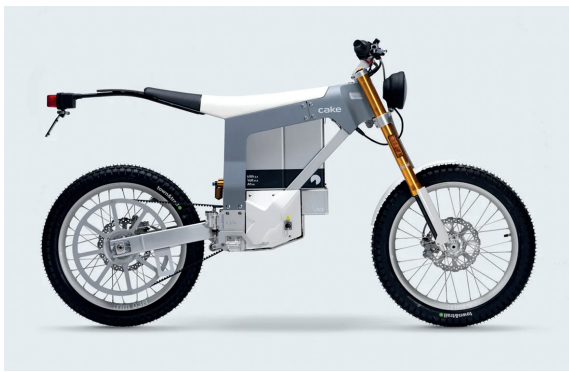
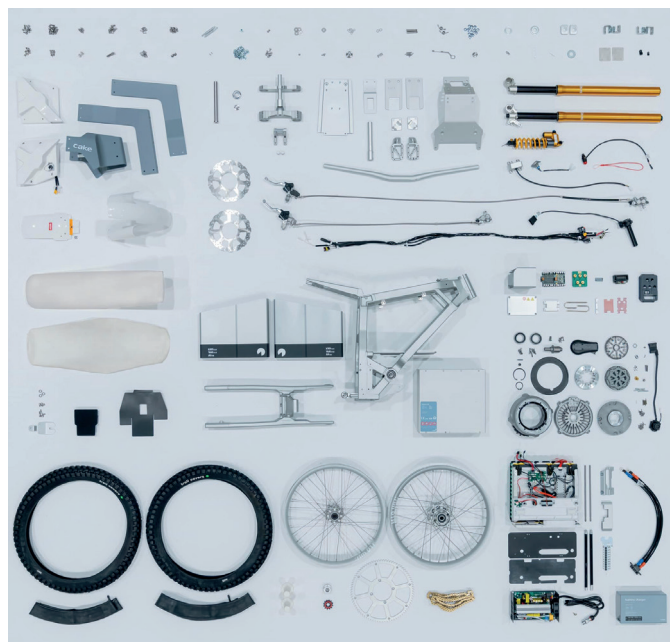


Figure 8: Kalk OR model in use



To simplify maintenance, the bike is built in a modular way like LEGO[®], with the goal of reducing the number of moving parts to minimize complexity. If a part malfunctions that whole part can be replaced. The bike itself can be serviced just like a bicycle. See **Figure 9**.

Figure 9: Modularized components of the Kalk OR model



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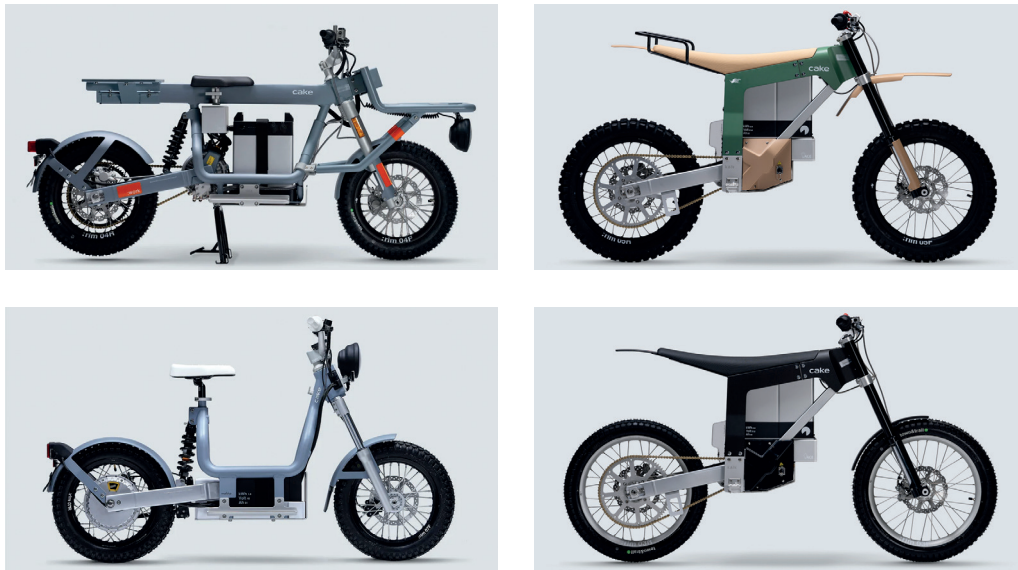


(Question 3 continued)

CAKE claims that noise and fume-free bikes that consider the environment, wildlife and fellow individuals that share the wilderness, opens up for more sustainable, respectful and active discovery.

CAKE also offers bikes in a range of models, including offroad, urban motorcycle and moped style bikes which are designed for use in both urban and rural environments, see **Figure 10**.

Figure 10: Various models in the CAKE range



(a) Outline how the CAKE company promotes the concept of decoupling. [2]

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(b) Outline **one** way in which governments could help promote electric motorcycles as a sustainable form of innovation in relation to existing technologies. [2]

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(Question 3 continued)

- (c) List **two** advantages of CAKE producing the motorcycle in different models as a product family. [2]

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- (d) Explain the importance of conducting market research for CAKE. [5]

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