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Design technology
Higher level
Paper 3

Wednesday 10 November 2021 (afternoon)

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. Smart's Shoes is a company that designs and manufactures comfortable and functional shoes, see **Figure 1**.

Smart's Shoes aims to develop sustainable processes and practices in the design and manufacture of their products.

Each year Smart's Shoes publishes a sustainability report. The infographic in **Figure 2** shows an overview of that report.

Figure 1: Smart's Shoes products

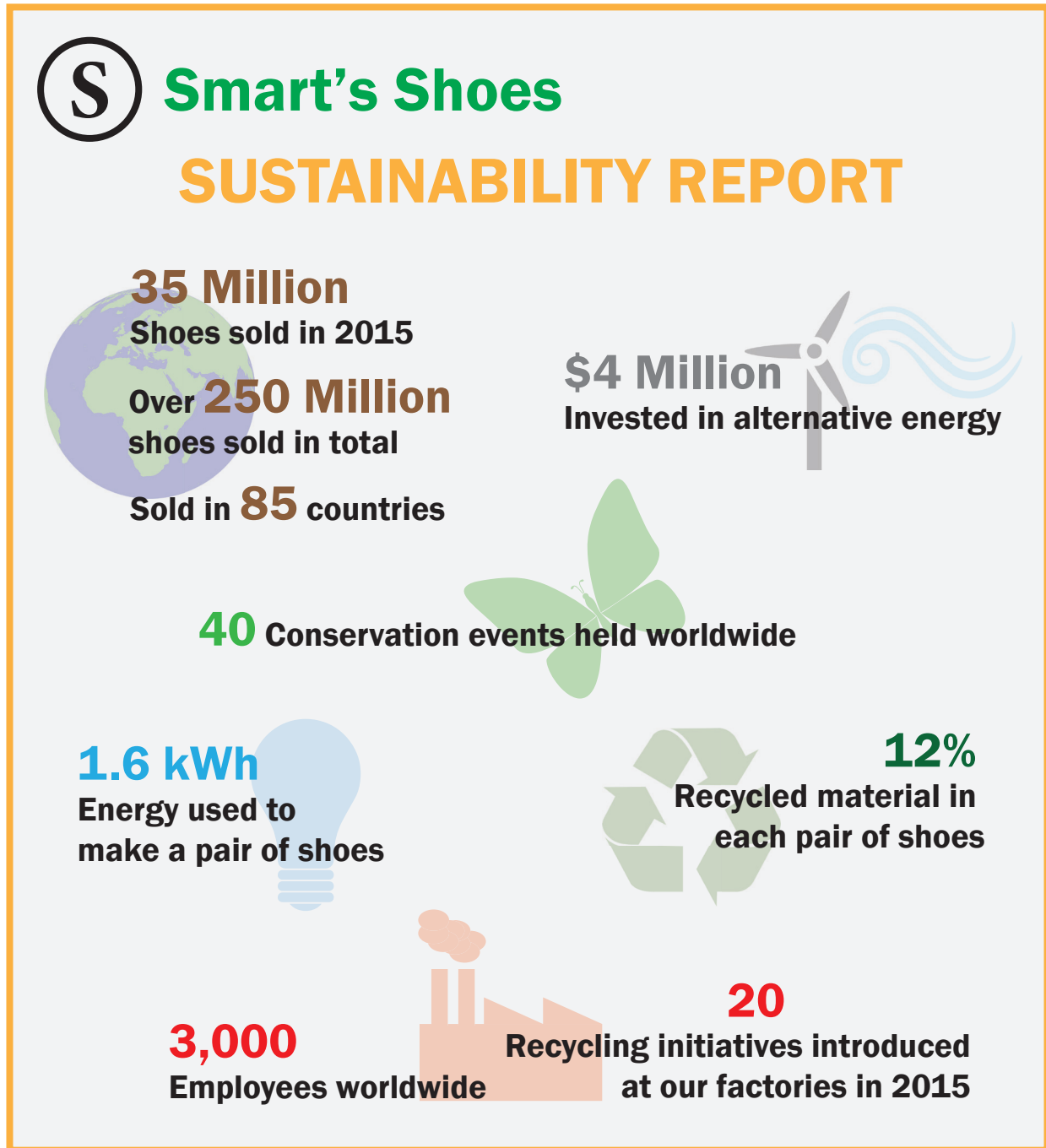


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(Question 1 continued)

Figure 2: Infographic of a sustainability report



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16EP03

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(Question 1 continued)

- (a) List **two** ways that Quality Assurance (QA) contributes to quality management. [2]

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- (b) Outline how decoupling contributes to Smart's Shoes sustainable policies and practices. [2]

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- (c) Outline **one** reason why Smart's Shoes would use lean production to help meet their sustainability goals. [2]

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(Question 1 continued)

(d) Explain the benefits of sustainability reporting for manufacturers such as Smart's Shoes. [4]

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- 2. Sir James Dyson is a British inventor and innovator, industrial designer and founder of Dyson Ltd. He is best known as the inventor of the Dual Cyclone bagless vacuum cleaner.

Dyson's products are on average 30% more expensive than similar products.

James Dyson says his products change the user experience because they perform better than competing products.

Dyson's innovations have also influenced other companies who sell in the same market. **Figure 3** shows the Samsung Powerstick which was based on the Dyson V7, see **Figure 4**.

Figure 3

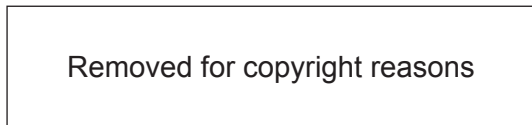
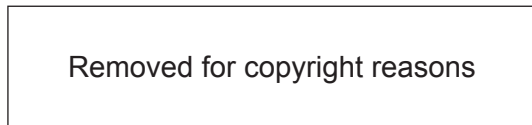


Figure 4



- (a) Outline **one** reason why Dyson Ltd would use computer integrated manufacturing (CIM). [2]

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(Question 2 continued)

- (b) Outline **one** reason why some consumers purchase Dyson products even though they are on average 30% more expensive than their competitors.

[2]

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- (c) Outline **one** reason why Dyson's competitors have adopted an imitative strategy in the development of their products.

[2]

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(Question 2 continued)

(d) Explain why large companies such as Dyson Ltd are likely to adopt a pioneering strategy. [4]

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Section B

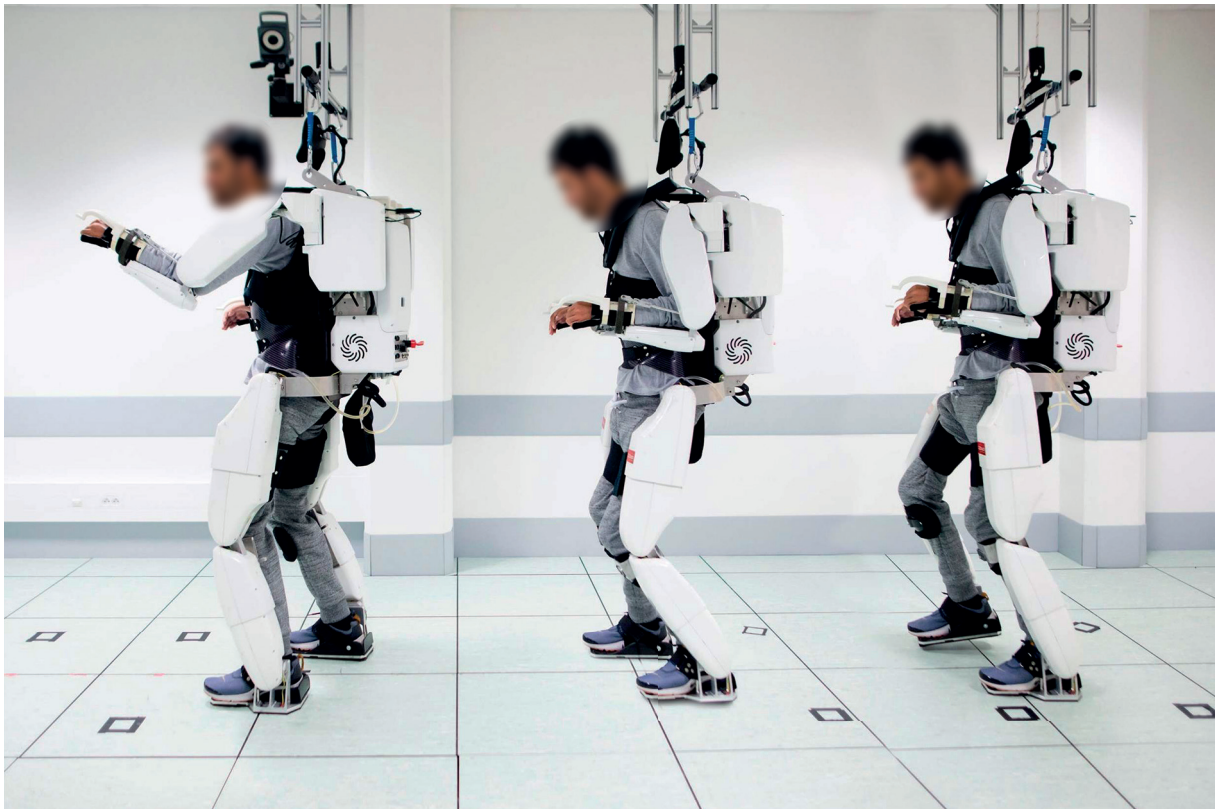
Read the case study. Answer the following question. Answers must be written within the answer boxes provided.

3. Clinattec, a French biomedical research centre, and the University of Grenoble have recently developed a device. This has enabled a patient, known as Thibault, to move all four of his paralysed limbs with a mind-controlled exoskeleton, see **Figure 5**.

Thibault had to undergo months of training before using the robotic exoskeleton. The training was performed in a usability lab, using his brain signals to control an avatar in a computer simulation.

The designers at Clinattec used a range of user-centred design (UCD) strategies in the development of the exoskeleton. This enabled them to gain a complete understanding of the needs of the users, tasks and environments, see **Figure 6** and **Figure 7**. The trial was considered a success by scientists.

Figure 5: Thibault walks using the exoskeleton



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(Question 3 continued)

Figure 6: A model showing the implant on Thibault's brain

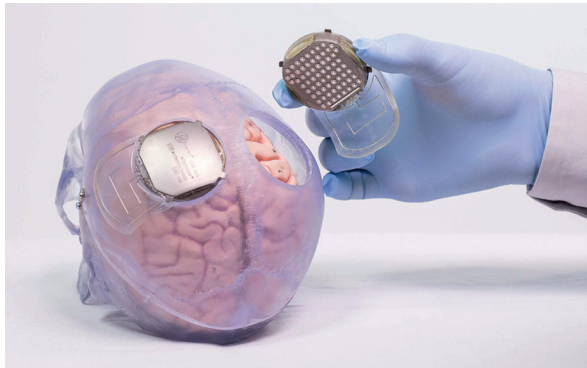


Figure 7: A multidisciplinary team of experts working with Thibault



(a) Outline **one** advantage of testing the exoskeleton in a usability lab.

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(b) Outline **one** reason why learnability is an important usability objective.

[2]

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(Question 3 continued)

- (c) Outline **one** reason why registered designs are used to protect intellectual property (IP). [2]

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- (d) The exoskeleton is a very complex design and required the development of mechanical and electronic systems for it to function successfully.

Suggest how the exoskeleton may be developed into a product family. [5]

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References:

Figure 5 © J. Treillet/FDD CEA Clinatec.

Figure 6 © La Brèche/CEA Clinatec.

Figure 7 © J. Treillet/FDD CEA Clinatec.

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