Diploma Programme
Programme du diplôme
Programa del Diploma

Design technology
Higher level
Paper 3

Thursday 8 November 2018 (morning)

Candidate session number

1 hour 30 minutes

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]**.

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Section A

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

1. Elon Musk, see **Figure 1**, is an entrepreneur, engineer, innovator and the founder and Chief Executive Officer (CEO) of Tesla. This company is attempting to design and manufacture products that promote sustainable consumption.

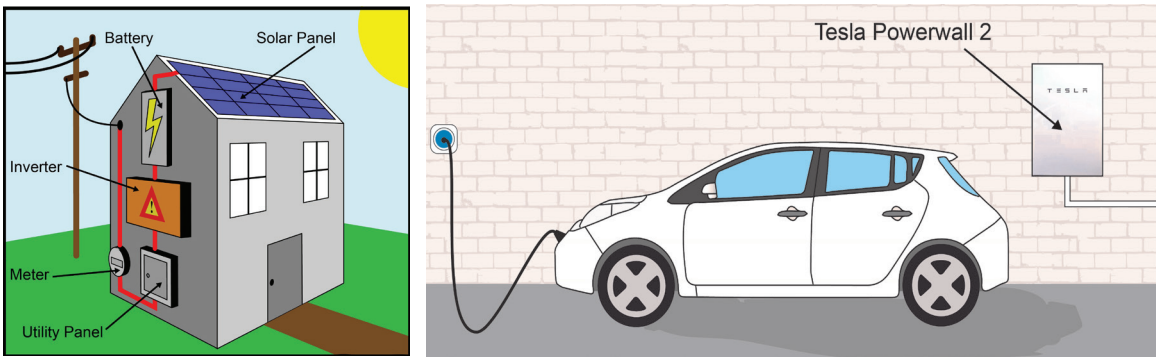
The Tesla Powerwall 2 is a lithium-ion battery pack that can be attached to the wall and provides electricity for household use. Electricity is generated by solar panels, see **Figure 2**, that are connected to the Powerwall 2. When there is no sunlight the electricity stored in the Powerwall 2 can be used to provide the electricity to run lighting or appliances.

The Powerwall 2 is a product that is entering the market and has the potential to ease the world's transition into the use of sustainable energy.

Figure 1: Elon Musk, Founder and CEO of Tesla and the Powerwall 2

[Sources: Elon Musk: adapted (cropped) image: KSC-20160408-PH_KLS0003_0027 (https://www.flickr.com/photos/nasakennedy/26223624532/). Image by NASA/Kim Shiflett under copyright (CC licence: https://creativecommons.org/licenses/by-sa/2.0/).
Powerwall 2: Raysonho @ Open Grid Scheduler / Grid Engine]

Figure 2: Tesla Energy and the Powerwall 2



[Sources: Tesla Energy: © International Baccalaureate Organization 2018
Powerwall 2: Raysonho @ Open Grid Scheduler / Grid Engine]

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(Question 1 continued)

(a) Outline how the Powerwall 2 system is an example of micro energy sustainability. [2]

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(b) List **two** methods of government intervention that could encourage the adoption of sustainable innovation such as the Powerwall 2. [2]

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(c) Outline how the Powerwall 2 can support the concept of ethical consumerism. [2]

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(Question 1 continued from page 3)

(d) Compare the consumer attitudes and behaviours towards the Powerwall 2 from the perspective of an eco-champion and that of an eco-phobe. [4]

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2. Garmin is a company known for its innovative approach to developing global positioning system (GPS) navigation devices. These devices are used to assist navigation for cars, boats and outdoor activities. Garmin were the first company to introduce portable GPS devices.

Recently, Garmin has developed products that are considered “wearable technologies”, which include a range of watches aimed at specific users such as runners, walkers, swimmers and golfers.

Garmin is considering using a lean production strategy to develop its product family, see **Figure 3**.

Figure 3: The Garmin Product Family

[Source: **Images reproduced with the permission of Garmin. Copyright 2019 Garmin Ltd. or its Subsidiaries. All Rights Reserved.**]

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(Question 2 continued)

(a) Outline **one** benefit for Garmin of developing a product family as a feature of lean production. [2]

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(b) Outline **one** advantage for Garmin of using computer integrated manufacturing (CIM). [2]

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(c) Outline the importance of consumer brand loyalty to Garmin. [2]

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(Question 2 continued from page 7)

(d) Discuss the advantages and disadvantages of companies such as Garmin adopting a pioneering corporate strategy. [4]

Section B

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

3. The IKO prosthetic arm was designed and developed by Carlos Arturo Torres with financial support from Lego Future Lab. One of Carlos's earliest patients was Dario, an 8-year-old Colombian boy, who was born without his right hand and part of his forearm. The challenge for Carlos was to develop a prosthetic arm for Dario based on the principles of user-centred design (UCD) and participatory design, see **Figures 4** and **5**.

Figure 4: Carlos Arturo Torres working with Dario

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Figure 5: Examples of Dario being involved in the development of the IKO prosthetic arm

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(Question 3 continued)

(a) List **two** market research strategies that could have been used in the development of the IKO prosthetic arm. [2]

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(b) Identify **two** characteristics of participatory design. [2]

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(c) User-centred design requires the designer to have a good understanding of the user, the task and the environment.

Outline how **one** of these requirements apply in relation to the design and development of the IKO prosthetic arm. [2]

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(Question 3 continued)

(d) Discuss why learnability and attitude are important usability objectives for the IKO prosthetic arm. [5]

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(Question 3 continued)

(e) Explain how the IKO prosthetic arm uses socio-pleasure, physio-pleasure **and** ideo-pleasure from the four-pleasure framework to satisfy the user. [9]

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