

© International Baccalaureate Organization 2022

All rights reserved. No part of this product may be reproduced in any form or by any electronic or mechanical means, including information storage and retrieval systems, without the prior written permission from the IB. Additionally, the license tied with this product prohibits use of any selected files or extracts from this product. Use by third parties, including but not limited to publishers, private teachers, tutoring or study services, preparatory schools, vendors operating curriculum mapping services or teacher resource digital platforms and app developers, whether fee-covered or not, is prohibited and is a criminal offense.

More information on how to request written permission in the form of a license can be obtained from <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organisation du Baccalauréat International 2022

Tous droits réservés. Aucune partie de ce produit ne peut être reproduite sous quelque forme ni par quelque moyen que ce soit, électronique ou mécanique, y compris des systèmes de stockage et de récupération d'informations, sans l'autorisation écrite préalable de l'IB. De plus, la licence associée à ce produit interdit toute utilisation de tout fichier ou extrait sélectionné dans ce produit. L'utilisation par des tiers, y compris, sans toutefois s'y limiter, des éditeurs, des professeurs particuliers, des services de tutorat ou d'aide aux études, des établissements de préparation à l'enseignement supérieur, des fournisseurs de services de planification des programmes d'études, des gestionnaires de plateformes pédagogiques en ligne, et des développeurs d'applications, moyennant paiement ou non, est interdite et constitue une infraction pénale.

Pour plus d'informations sur la procédure à suivre pour obtenir une autorisation écrite sous la forme d'une licence, rendez-vous à l'adresse <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

© Organización del Bachillerato Internacional, 2022

Todos los derechos reservados. No se podrá reproducir ninguna parte de este producto de ninguna forma ni por ningún medio electrónico o mecánico, incluidos los sistemas de almacenamiento y recuperación de información, sin la previa autorización por escrito del IB. Además, la licencia vinculada a este producto prohíbe el uso de todo archivo o fragmento seleccionado de este producto. El uso por parte de terceros —lo que incluye, a título enunciativo, editoriales, profesores particulares, servicios de apoyo académico o ayuda para el estudio, colegios preparatorios, desarrolladores de aplicaciones y entidades que presten servicios de planificación curricular u ofrezcan recursos para docentes mediante plataformas digitales—, ya sea incluido en tasas o no, está prohibido y constituye un delito.

En este enlace encontrará más información sobre cómo solicitar una autorización por escrito en forma de licencia: <https://ibo.org/become-an-ib-school/ib-publishing/licensing/applying-for-a-license/>.

Design technology
Higher level
Paper 3

Friday 6 May 2022 (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]**.



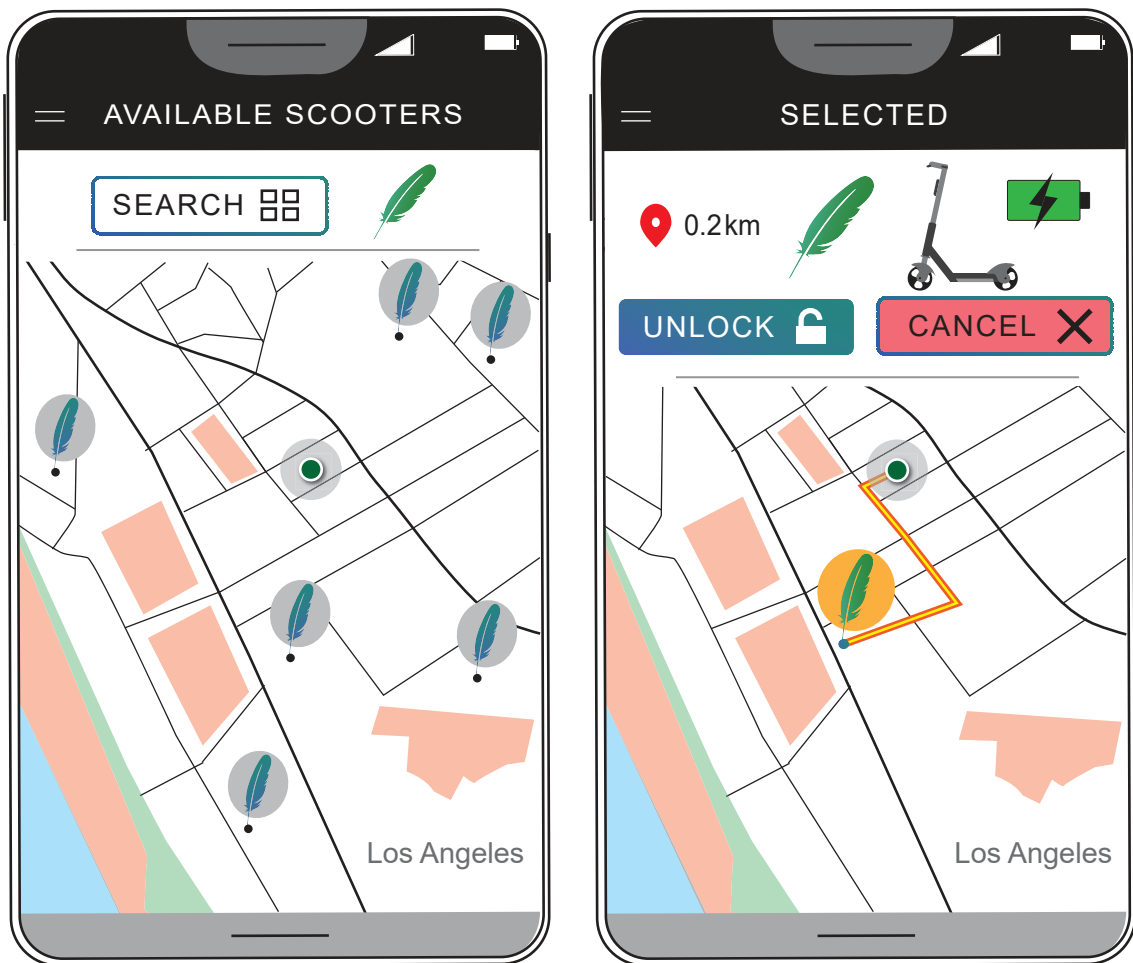
Section A

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

1. Soar Electric Scooter Rental

“Scooter sharing” has become popular in cities all over the world. E-scooters are being promoted as a sustainable mode of transport by providing an alternative to cars. One e-scooter company, Soar, offers e-scooters in several cities that can be easily rented via a smartphone app. A rider uses the Soar app to locate the nearest e-scooter, see **Figure 1**.

Figure 1: A representation of the Soar smartphone app



(This question continues on the following page)



12EP02

(Question 1 continued)

Soar purchased their first-generation e-scooters from manufacturer Xiomani for US\$550 each. To break-even an e-scooter needs to be used five times a day for five months. As the Soar smartphone app tracks battery charge, location and usage, it was found that many of these Xiomani scooters were lasting less than two months. Many were simply discarded, see **Figure 2**.

Figure 2: Discarded e-scooters



[Source: MarioGuti / iStock.]

- (a) Outline **one** reason why Soar use just-in-case (JIC) production for their Soar e-scooter. [2]

.....
.....
.....
.....

- (b) Outline **one** way how the use of statistical process control can lead to improvements in the design of the Soar e-scooter. [2]

.....
.....
.....
.....

(This question continues on the following page).



12EP03

Turn over

- 2. Many of Apple's customers own a number of Apple devices such as iPhones, iPads, laptops, iWatches and AirPods, see **Figure 3**.

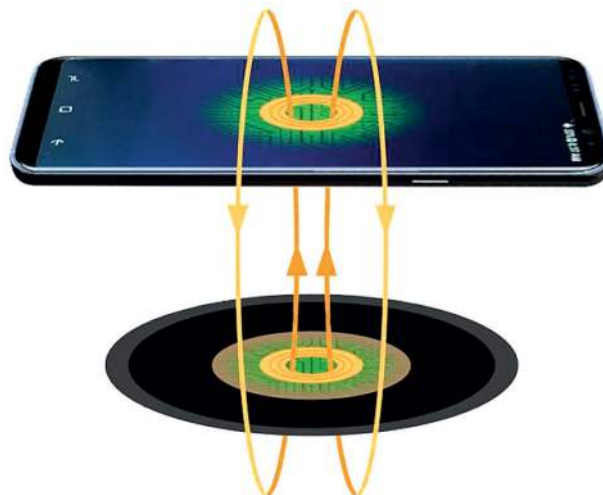
Figure 3: A selection of Apple products



[Source: Zurijeta/Shutterstock.com.]

Many Apple users found the efficient charging of multiple devices could be difficult. Apple aimed to solve this issue when they filed their patent for the AirPower, a wireless charger that could charge three devices at once. To achieve this the coils must be placed directly on top of one another, see **Figure 4**. If the coils are not aligned, the device will not charge.

Figure 4: Wireless charging



(This question continues on the following page)



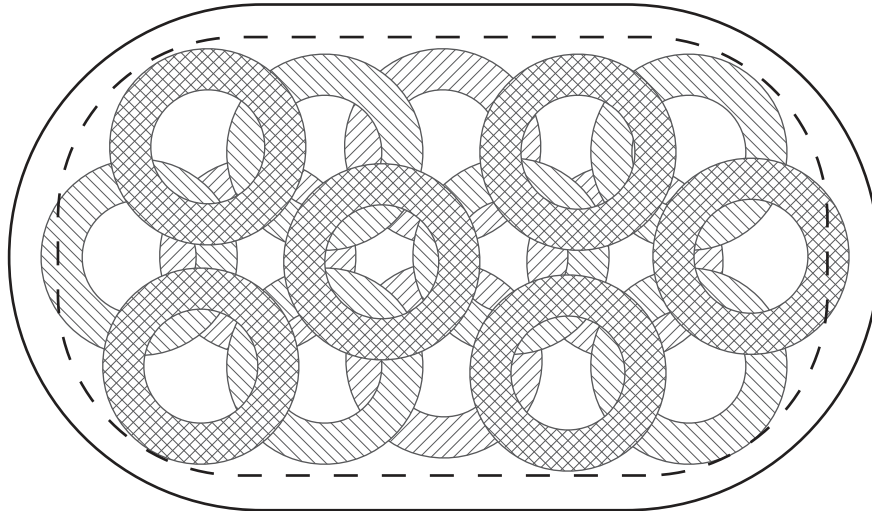
12EP05

Turn over

(Question 2 continued)

The AirPower aimed to solve this issue by stacking and offsetting the coils, see **Figure 5**. Stacked coils gave the AirPower the ability to charge multiple devices at once. The large charging area made it easier to align the coils.

Figure 5: Registered patent for the design of the AirPower, showing many stacked coils



During testing, Apple found that the AirPower was unsafe because the coils overheated. This led to Apple cancelling the development of the AirPower and the product was never released to the public.

- (a) Outline **one** way Apple is using the corporate strategy of product development for the AirPower. [2]

.....

.....

.....

.....

- (b) List **two** ways the AirPower was intending to achieve enhanced usability. [2]

.....

.....

.....

.....

(This question continues on the following page)



(Question 2 continued)

(c) Outline how a testing house might be used to provide quality assurance. [2]

.....

.....

.....

.....

(d) Explain how Apple utilizes “product families” to minimize inventory. [4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



Section B

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

- 3. The first version of the Impossible Burger was released in 2016, with the aim to be “craveable” to meat eaters. To achieve this, Impossible Foods developed a meat substitute that had everything a “meat lover” looks for in a burger: juicy and flavorful with a pink middle and a convincing texture and smell. This meatless burger even cooks and “bleeds” like beef.

To market the Impossible Burger to meat eaters, Impossible Foods partnered with well-recognized restaurants such as Burger King who have included the Impossible Burger on their menu. This provided customers the opportunity to try this new food without changing where they would normally eat.

- (a) List **two** members that could have been included in the multidisciplinary team that would have been used by Impossible Foods to develop the Impossible Burger. [2]

.....

.....

.....

.....

- (b) Outline how physio-pleasure was considered in the development of the Impossible Burger. [2]

.....

.....

.....

.....

- (c) The development cycle requires considerable consumer testing. Outline why iterative design is a feature of a pioneering strategy. [2]

.....

.....

.....

.....

(This question continues on the following page)



Please **do not** write on this page.

Answers written on this page
will not be marked.



12EP11

Turn over

References:

Figure 2 MarioGuti / iStock.

Figure 3 Zurijeta/Shutterstock.com.

Figure 4 With permission from Powermat Technologies.

Figure 5 AirPower charger patent was granted by the patent office on 2019-12-17, Figure 2 [image online] Available at: <https://uspto.report/patent/grant/10,511,197>. Source adapted.

Question 3 With permission from Impossible Foods Inc.

All other texts, graphics and illustrations © International Baccalaureate Organization 2022



12EP12