

© International Baccalaureate Organization 2021

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 2021

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, 2021

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 14 May 2021 (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. The Light Phone see **Figure 1**, is a small, low-functionality mobile phone that has been designed to tackle the increasing issue of smartphone addiction. Designed to be used “as little as possible” the original Light Phone has only one primary function; to make and receive calls.

Figure 1: The original Light Phone



The designers intended the Light Phone to be used in addition to, rather than replace, a smartphone as it does not have internet capabilities. This allows the user to leave their smartphone at home and “disconnect” while still having access to a communication device.

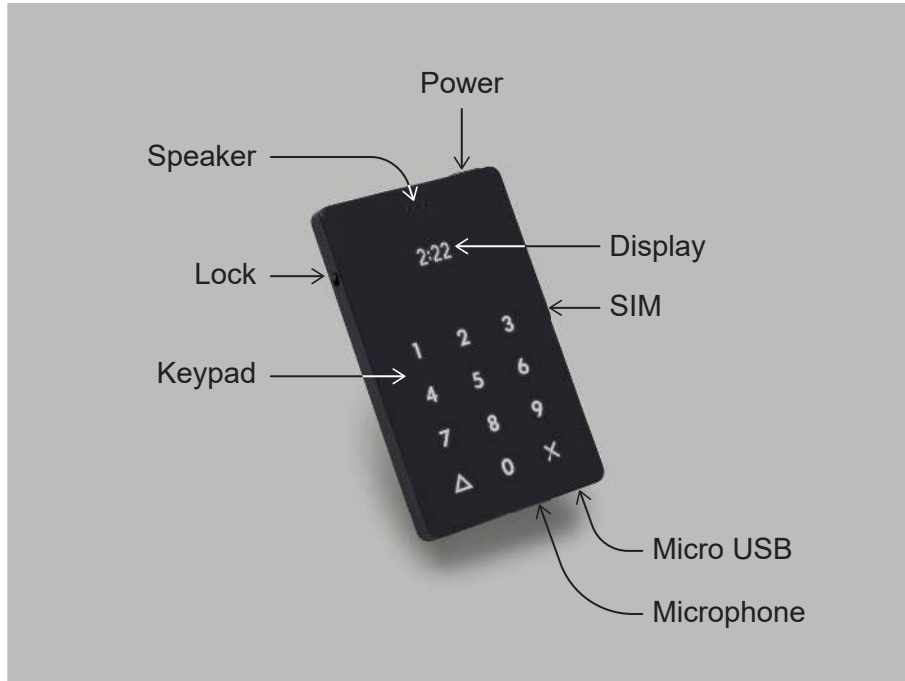
The designers of the Light Phone have deliberately designed it with limited functionality to prevent the habit of “phone fidgeting”, the act of constantly checking one’s smartphone without purpose. The designers believe that modern gadgets and applications are designed to gain and hold the user’s attention. The Light Phone is the size of a credit card which means it can be easily carried, see **Figure 2**.

(This question continues on the following page)



(Question 1 continued)

Figure 2: Features of the Light Phone



(a) Outline **one** reason why multidisciplinary teams would have been important in developing the Light Phone.

[2]

.....

.....

.....

.....

(b) List **two** benefits of enhanced usability.

[2]

.....

.....

.....

.....

(This question continues on the following page)



12EP03

Turn over

(Question 1 continued)

- (c) Outline **one** disadvantage of using a usability laboratory to determine whether the Light Phone has led to a decrease in “phone fidgeting”.

[2]

.....

.....

.....

.....

- (d) The Light Phone concept is built on the idea that users need to “disconnect” from their smartphones at times.

Explain why designers might use personae and characteristics in their user research to define the problem.

[4]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



- 2. When Adidas bought Reebok in 2006, its aim was to develop the classic brand by focussing on its fitness products and innovation.

Reebok’s most innovative move was to develop its proprietary *Liquid Factory* technology, see **Figure 3**. This robotics and 3D printing manufacturing technology “draws” the sole of the shoe in three dimensions, see **Figure 4**.

Traditional shoe making is a time-consuming process and requires human resources to be used, as well as individual shoe moulds for each model of shoe, see **Figure 5**.

The *Liquid Factory* technology can draw clean lines in layers without the use of a shoe mould. This creates a unique fit system that stretches and moulds around the foot.

The first concept shoe that was brought to market with the *Liquid Factory* technology was the Reebok Liquid Speed, which combines the outsole and lacing together in one piece, see **Figure 6**. The Reebok Liquid Speed was produced in batches of 300, does not require moulds to be created and is only sold online.

The *Liquid Factory* process is much faster than traditional shoe manufacturing and customizations can happen in real time by reprogramming the robots. This allows Reebok to react much faster to customer demands and trends.

Figure 3: 3D printing of the Reebok Liquid Speed shoe

Figure 4: 3D printed sole

Removed for copyright reasons

Removed for copyright reasons

(This question continues on the following page)



12EP05

Turn over

(Question 2 continued)

Figure 5:
A traditional shoe mould

Removed for copyright reasons

Figure 6:
The Reebok Liquid Speed shoe

Removed for copyright reasons

- (a) Outline **one** reason why the production method for the Liquid Speed shoe is an example of just in time (JIT) production.

[2]

.....

.....

.....

.....

- (b) Outline **one** reason why Reebok has used computer integrated manufacturing (CIM) to make a smaller scale of production economically viable.

[2]

.....

.....

.....

.....

(This question continues on the following page)



12EP06

(Question 2 continued)

- (c) Reebok may not be able to achieve market dominance with its Liquid Speed shoes as imitator products have started to appear in the marketplace.

Explain **two** reasons why innovations fail to succeed whilst imitator products dominate. [6]

A large rectangular box containing horizontal dotted lines for writing.



12EP07

Turn over

Section B

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

- 3. All over the world, there have been a range of both government and corporate initiatives that aim to reduce waste by targeting single-use plastics. For example, in Australia, Woolworths was one of the first supermarket chains to ban single-use plastic bags. Starbucks aims to remove all single-use plastic straws from its stores by 2020.

Pressure groups such as Greenpeace have educated the public on the problems of single-use plastics. According to Greenpeace, there are 12.7 million tonnes of plastic dumped into the oceans each year. As companies such as Woolworths and Starbucks are highlighting this issue, more consumers are seeking out green products and trying to make more sustainable choices. This has led to the demand for innovative products that will decrease the reliance on single-use plastics.

Street food and takeaway food is an integral part of many cultures. Futuretensils is a company trying to disrupt the single-use plastic market with their line of edible cutlery, see **Figure 7**. Founded by Indian entrepreneurs in response to the 120 billion pieces of disposable plastic cutlery used in India each year, Futuretensils has a range of one-use edible cutlery and produces forks, spoons, and chopsticks in a variety of flavours: sweet, savory, and plain. The cutlery has a shelf life of 18–24 months and will easily biodegrade in a few days if uneaten. In product reviews, Futuretensils’ edible cutlery has been able to withstand use in very liquid dishes such as like soup. According to reviews, consumers enjoy the taste too.

Futuretensils’ cutlery is made from different flours and contains no preservatives, chemicals, additives or dairy products. It is manufactured at very high temperatures. In the future, Futuretensils’ plans to release flatware, such as bowls and plates.

Figure 7: Futuretensils’ edible cutlery



(This question continues on the following page)



12EP08

(Question 3 continued)

- (a) Outline why the development of edible cutlery required the use of a usability testing session.

[2]

.....

.....

.....

.....

- (b) Outline how edible cutlery meets the need for ideo-pleasure.

[2]

.....

.....

.....

.....

- (c) List **two** ways how pressure groups such as Greenpeace influence consumer preferences.

[2]

.....

.....

.....

.....

(This question continues on the following page)



12EP09

Turn over

(Question 3 continued)

- (d) Explain how the use of market research strategies would have led to the development of edible cutlery.

[5]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(This question continues on the following page)



12EP10

(Question 3 continued)

- (e) Explain **three** ways in which Futuretensils is meeting Datschefski's principles of sustainable design.

[9]

A large rectangular box containing 25 horizontal dotted lines for writing the answer.



12EP11

References:

Figure 1 Provided with permission from The Light Phone.

Figure 2 Provided with permission from The Light Phone.

Figure 7 Pixabay.



12EP12