Diploma Programme
Programme du diplôme
Programa del Diploma

Design technology
Higher level and standard level
Paper 2

Monday 14 November 2016 (morning)

1 hour 30 minutes

Candidate session number

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer one question.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.

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Section A

Answer **all** questions. Write your answers in the boxes provided.

1. **Figure 1** shows the Walker Edison computer corner desk with a steel tubular frame and black safety glass work surface.

Figure 1: Walker Edison Soreno 3-Piece Corner Desk

(a) (i) State **one** joining technique which would have been used for the steel frame in **Figure 1**. [1]

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(ii) Outline **one** reason why safety glass is used for the computer desk in **Figure 1**. [2]

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(Question 1 continued)

(b) (i) Outline **one** advantage of the use of tubular metal to the manufacturer. [2]

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(ii) Outline **one** disadvantage of the use of tubular metal to the consumer. [2]

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(Question 1 continued)

(c) (i) Outline **one** potential safety issue for the keyboard shelf of the computer desk table in **Figure 1**. [2]

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(ii) Explain **one** maintenance issue for consumers of the use of glass for the work surface of the computer desk in **Figure 1**. [3]

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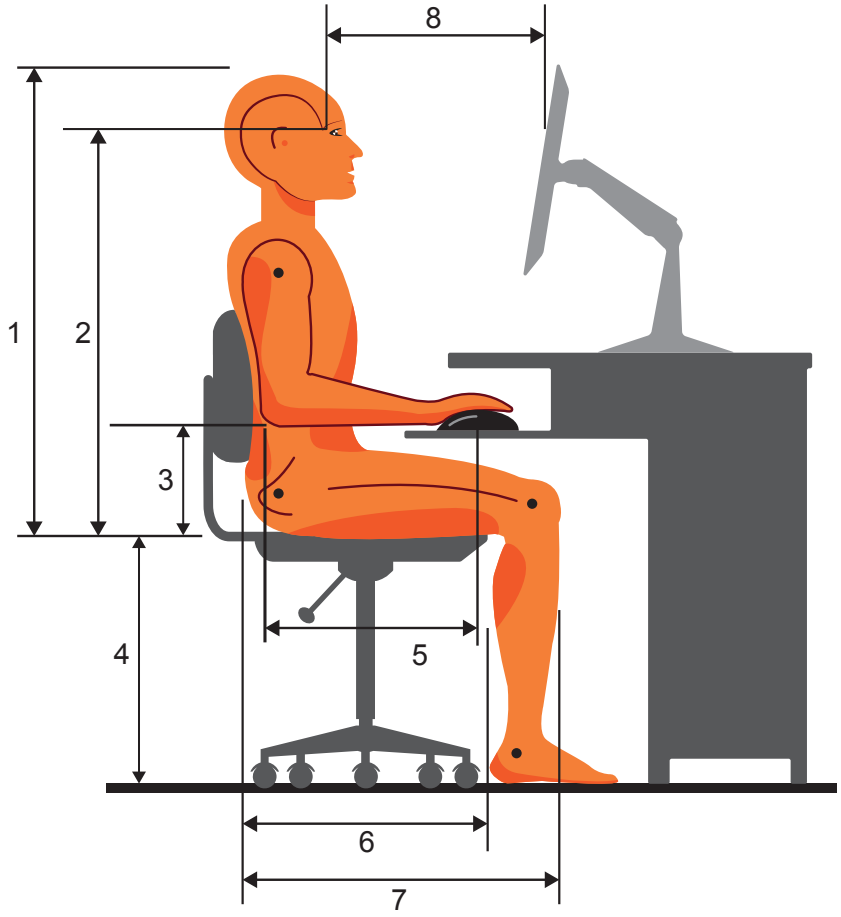
(Question 1 continued)

Figure 2 shows a cross section of an ergonome sitting at a computer desk. **Table 1** shows the 5th, 50th and 95th percentile ranges for normal eye level. Designers use various data collection methods in order to gather data for the design of the computer desk.

Figure 2: Ergonome at a computer desk



[Source: adapted from sullivanchiromaine.com]

Table 1: Body sizes of 5th, 50th and 95th British adults. All measurements are in millimetres

		5th percentile	50th percentile	95th percentile
1	Sitting height	795	880	965
2	Sitting eye height	685	765	845
3	Sitting elbow height	185	240	295
4	Seat height	355	420	490
5	Elbow-grip length	304	343	387
6	Seat length	435	488	550
7	Buttock-knee length	520	583	645
8	Reading distance	620	710	850

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(Question 1 continued)

(d) (i) Calculate the range of adjustability for the seat height for the chair in **Figure 2**. [2]

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(ii) Outline why static physical data measurements are used to collect the anthropometric data for the computer desk in **Figure 2**. [2]

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(Question 1 continued)

(e) (i) Outline **one** reason why an ordinal scale is used to collect data about the comfort of the chair in **Figure 2**. [2]

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(ii) Outline **one** biomechanical factor important in the design of the adjustable mechanism on the chair in **Figure 2**. [2]

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2. The Swiss Army knife was first manufactured in 1890 and is considered a design classic. It is characterised by a large number of different tools contained within a distinctive casing. The casing is made of plastic and the tools are made of stainless steel. **Figures 3 and 4** show two typical knives created for different market segments.

Figure 3: Hard use purpose Swiss Army knife

Removed for copyright reasons

Figure 4: Nailclip Swiss Army knife

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(This question continues on the following page)

(Question 2 continued)

(a) List **two** factors that would make the Swiss Army knife be considered as a design classic. [2]

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(b) Describe how form follows function in the case of a Swiss Army knife. [2]

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3. Explain how the Swiss Army knife designers have used market segments to increase the sales of the Swiss Army knife. [3]

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4. Explain how the principle of dematerialization has been beneficial to the Swiss Army knife. [3]

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Section B

Answer **one** question. Write your answers in the boxes provided.

5. **Figure 5** shows a manual production line in the Plan Toys manufacturing plant based in Trang, Thailand. Plan Toys produces a wide range of child safe toys made of rubber wood which is a medium density tropical hardwood.

Figure 6 shows a finished green dollhouse with furniture. The company has worldwide recognition for its sustainable manufacturing good practice.

Figure 5: Plan Toys manual production of the dollhouse

[Source: http://en.plantoys.com]

Figure 6: Green dollhouse with furniture

[Source: http://en.plantoys.com]

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(Question 5 continued)

(a) List **two** mechanical properties of rubber wood, which would make it suitable to be used in the dollhouse toy in **Figure 6**. [2]

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(b) Explain how Plan Toy can promote good environmental practices in relation to the production of the rubber wood it uses as a raw material for the dollhouse. [3]

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(Question 5 continued)

(c) Discuss whether Plan Toys should introduce assembly line production for the production of the dollhouse in **Figure 5**. [6]

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(Question 5 continued)

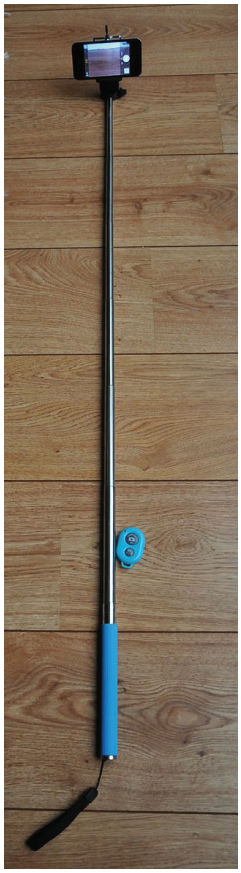
(d) Explain **three** drivers for green design that would lead to Plan Toys developing an environmentally friendly factory. [9]

6. **Figure 7** shows a selfie stick. The selfie stick is a monopod used to take selfie photographs by positioning a smartphone or camera beyond the normal range of the arm. They were developed as early as the 1990s, but did not rise to prominence until the evolution of smartphones.

The selfie stick was developed by inventors who had seen tourists trying to take pictures of themselves and realized that there may be a better way.

A typical selfie stick is made up of a rubber hand grip, an aluminium telescopic pole, a mechanism to hold the smartphone, and a Bluetooth device to trigger the camera on the smartphone.

Figure 7: A selfie stick



[Source: https://en.wikipedia.org/wiki/Selfie_stick#/media/File:Completely_expanded_Selfie_Stick.jpg by 河中桥 - camera-at-home, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=37025375]

(a) Outline why the innovation of the selfie stick may be seen as an example of market pull. [2]

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(Question 6 continued)

(b) Explain **one** benefit relating to human factors of designing the selfie stick handle with a soft rubber finish. [3]

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(c) Explain **two** important design criteria for the selfie stick. [6]

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(Question 6 continued)

(d) Explain the product life cycle of the selfie stick in relation to its growth, planned obsolescence and its potential for further development as an innovation. [9]

7. **Figure 8** shows the Nespresso Pixie coffee machine. It is being marketed as a fast, intuitive, cool, ergonomic and energy-efficient coffee-making machine. The main case and nozzle are made out of thermosetting plastics and the side panels out of recycled aluminium with a handle made of steel. The aluminium sides of the Nespresso Pixie coffee machine are made by CNC milling machines. The coffee capsules for the Nespresso are also made from aluminium.

The Nespresso Pixie automatically switches off after 9 minutes of inactivity thus making its energy consumption 40% less than other coffee machines. This competitive advantage is a key marketing point used by Nespresso.

The Nespresso Pixie has been developed using proprietary techniques and users have found it impossible to fit non-Nespresso parts to the Pixie. Nestle, the parent company, has applied for a patent for the mechanism in the coffee machine. However, this was rejected by a Swiss law court.

Figure 8: Nespresso Pixie coffee machine

(This question continues on the following page)

(Question 7 continued)

(a) Outline why a thermosetting plastic material is required for the nozzle of the Nespresso Pixie coffee machine in **Figure 8**. [2]

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(b) Explain how the materials of the side panels contribute to reducing the environmental impact of the Nespresso Pixie at the disposal stage of its life cycle. [3]

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(Question 7 continued)

(c) Discuss why a product such as the Nespresso Pixie may or may not be protected by a patent. [6]

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(Question 7 continued)

(d) Explain why CNC is an appropriate technique for manufacturing the aluminium sides of the Nespresso Pixie coffee machine. [9]

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