

STUDENT NUMBER Letter

PRODUCT DESIGN AND TECHNOLOGY

Written examination

Thursday 8 November 2018

Reading time: 9.00 am to 9.15 am (15 minutes)

Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A	10	10	45
B	10	10	45
			Total 90

- Students are permitted to bring into the examination room: pens, lead and coloured pencils, water-based pens and markers, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.
- No calculator is allowed in this examination.

Materials supplied

- Question and answer book of 20 pages
- Detachable insert for Section B in the centrefold

Instructions

- Detach the insert from the centre of this book during reading time.
- Write your **student number** in the space provided above on this page.
- All written responses must be in English.

At the end of the examination

- You may keep the detached insert.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

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SECTION A**Instructions for Section A**

Answer **all** questions in the spaces provided.

Question 1 (3 marks)

The product design process consists of a series of steps.

Give a brief outline of each of the three steps listed below.

	Brief outline of step
Visualisations	
Scheduled production plan	
Product evaluation	

Use the following information to answer Questions 2–7.

M+D crutches

Most crutches place pressure on the end user’s armpits, wrists and hands. M+D crutches, however, support the end user’s elbows, evenly distribute weight and relieve that pressure. M+D crutches are adjustable in both arm length and in height. They are suitable for end users who are 150 cm to 200 cm in height and who weigh up to 136 kg.

Due to copyright restrictions,
this material is not supplied.

- ① Elbow support causes no pain to hands, wrists or armpits.
- ② Handle moves to allow hands-free walking.
- ③ Flexible armband
- ④ Hinged arm support
- ⑤ Adjusts to fit users of 150–200 cm in height and up to 136 kg in weight.
- ⑥ Shock-absorbing foot
- ⑦ Interchangeable foot

Source: images from M+D, <www.mobilitydesigned.com>; diagram adapted from Tuvie, <www.tuvie.com>

Question 2 (2 marks)

List two expectations that the end users of the M+D crutches may have.

1. _____

2. _____

Question 3 (4 marks)

- a. List one qualitative and one quantitative type of market research that may have been conducted for the M+D crutches.

2 marks

	Type of market research
Qualitative	
Quantitative	

- b. How could the information from both types of market research listed above have been used in the development of the M+D crutches?

2 marks

Question 4 (2 marks)

Material selection is important for the primary function of the M+D crutches.

Describe another product design factor that is also important for the primary function of the M+D crutches.

Question 5 (3 marks)

Identify **one** new technology and explain how it could have been used in the design and development stage of the M+D crutches.

Question 6 (5 marks)

- a. It is likely that anthropometric data has been used to establish the range of end users for whom the M+D crutches are suitable.

What is anthropometric data?

1 mark

- b. Why is the use of anthropometric data important?

2 marks

- c. How would this data have been used in the design and development of the M+D crutches?

2 marks

Question 7 (2 marks)

If the M+D crutches become very popular, more crutches will need to be produced.

Describe the most suitable scale of manufacturing system that would allow a larger number of crutches to be produced.

Question 8 (17 marks)

Plastic bottles are made from a petroleum product called polyethylene terephthalate (PET). PET is a lightweight plastic that is widely used for packaging foods and drinks, especially soft drinks and water.

Large amounts of fossil fuels are needed to make and transport PET plastic bottles. In particular, a lot of oil is needed to make PET plastic bottles. The amount of oil needed to produce one bottle would fill one quarter of the bottle.

Old PET plastic bottles can be recycled into a new plastic or fibre called recycled PET (rPET).

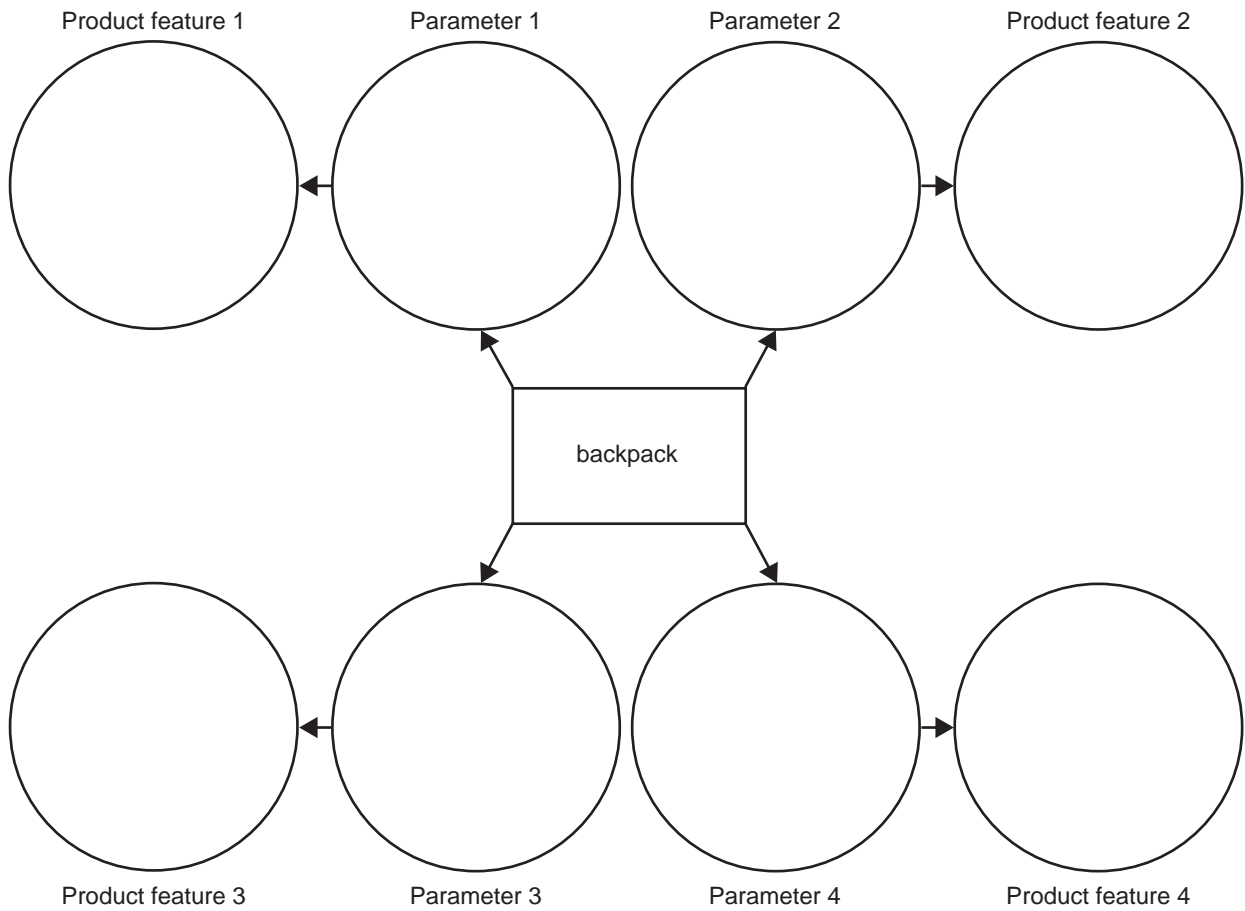
Onya backpacks are made from rPET. Each backpack is made from the rPET of up to 10 recycled plastic bottles.

**Product features:**

- comfortable, easily adjustable shoulder straps
- practical handle
- simple zip-up closure
- mobile phone/iPod/radio can be innovatively stored inside pouch when bag is in use
- direct headphone porthole
- ultimate lightweight (90 g)
- useful front pocket
- 12 cm deep, 28 cm across, 42 cm high
- 14 L capacity
- made from rPET of up to 10 recycled plastic bottles
- 12-month manufacturer's warranty

Source: images from Onya, <www.onyalife.com>; text adapted from Onya, <www.onyalife.com>

- a. Complete the concept map below with four parameters related to the end user of the Onya backpack and link each parameter to a product feature. 8 marks



- b. It is likely that the designers of the Onya backpack used multiple creative thinking techniques during the development of the product.

Excluding brainstorming, describe another creative thinking technique that the designers may have used. 2 marks

- c. List two critical thinking techniques that the designers of the Onya backpack may have used to refine the design prior to production. 2 marks

1. _____

2. _____

d. The quality of a product is important to end users.

List two product design factors that the designers of the Onya backpack may have used to create a quality product from recycled material.

2 marks

1. _____

2. _____

e. Recently, more consumers have been buying products online instead of physically visiting stores. The designers of the Onya backpack are using online marketing to promote and sell their product. One advantage of online marketing is that the target market is increased due to the reach of the internet. One disadvantage is that the product has to satisfy the requirements of a range of end users.

Explain how the needs and interests of potential end users who may live overseas, interstate or locally could be identified.

3 marks

Question 9 (3 marks)

- a. Identify **one** issue associated with planned obsolescence. 1 mark

- b. Describe the impact this issue has on product development. 2 marks

Question 10 (4 marks)

- a. What is lean manufacturing? 1 mark

- b. Give **one** example of lean manufacturing. 1 mark

- c. How may lean manufacturing help a designer to be more aware of environmental impacts during the product development process? 2 marks

SECTION B

Instructions for Section B

Please remove the insert from the centre of this book during reading time.
 Use the material provided in the insert to answer the questions in this section.
 Answer **all** questions in the spaces provided.

Tick (✓) one product from the list below and use this product to answer the questions that follow.

mobile refreshment cart	
event staff jacket	
souvenir game	

Question 1 (10 marks)

Write the specifications of the design brief for your product. The specifications should include:

- an outline of the context, including the end user
- four relevant product design factors and their associated parameters.

Design specifications

Outline of context _____

End user _____

Product design factors and associated parameters

	Product design factor	Associated parameter
1		
2		
3		
4		

Question 2 (2 marks)

- a. Identify **one** specification from Question 1 that indicates how your product would appeal to the end user visiting Melbourne. 1 mark

- b. Briefly explain why this specification is important to the end user. 1 mark

Question 3 (2 marks)

- a. Identify **one** parameter from your specifications in Question 1 and write this as an evaluation question. 1 mark

- b. Identify the area of research that could help you satisfy this parameter. 1 mark

Question 4 (3 marks)

- a. Identify **one** recycled material that you will use in your product. 1 mark

- b. Briefly describe **two** characteristics and/or properties of this material that make it suitable for your product. 2 marks

Question 5 (2 marks)

When evaluating your product for an end user, safety is important.

Explain how considering safety may affect the function of your product.

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Question 6 (8 marks)

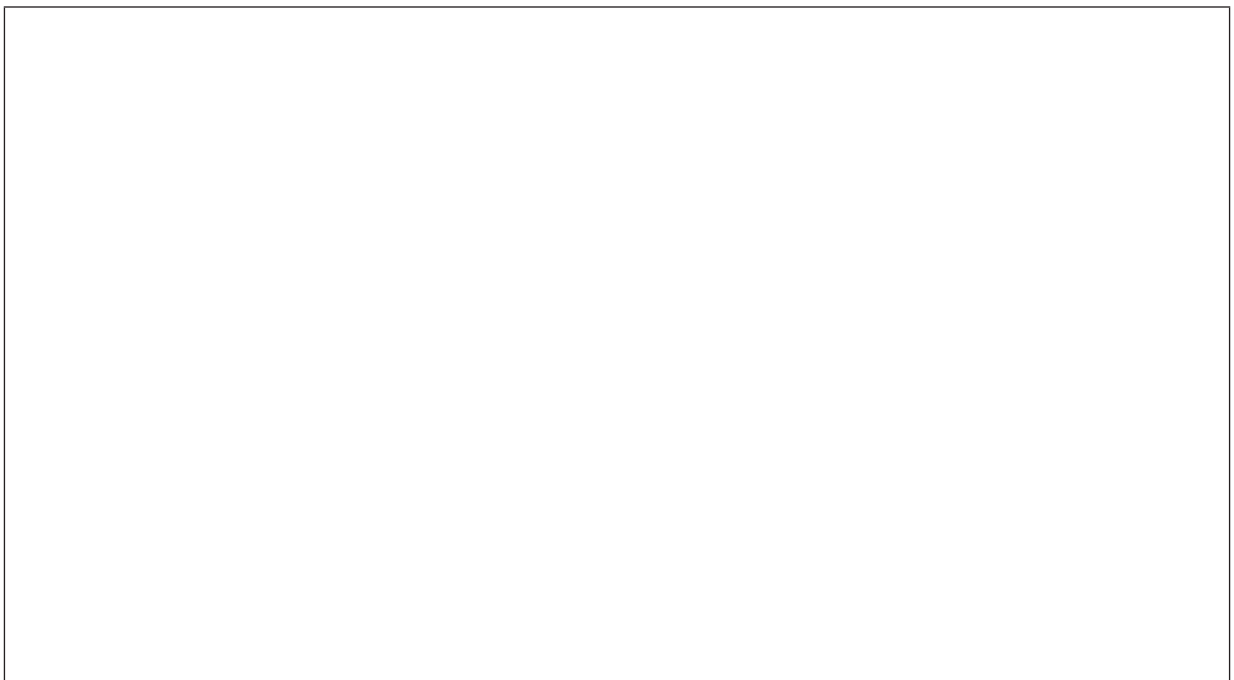
- a.** Draw and annotate two visualisations for your design in the boxes provided below. 6 marks
Your response to **part a.** will be assessed against the following assessment criteria.

1	innovation and creativity	2 marks
2	clarity and detail	2 marks
3	suitability/function for intended use of the product	2 marks

Visualisation 1



Visualisation 2



- b.** Choose the visualisation from **part a.** that best meets the design specifications you wrote in Question 1 and justify your choice.

2 marks

Visualisation number _____

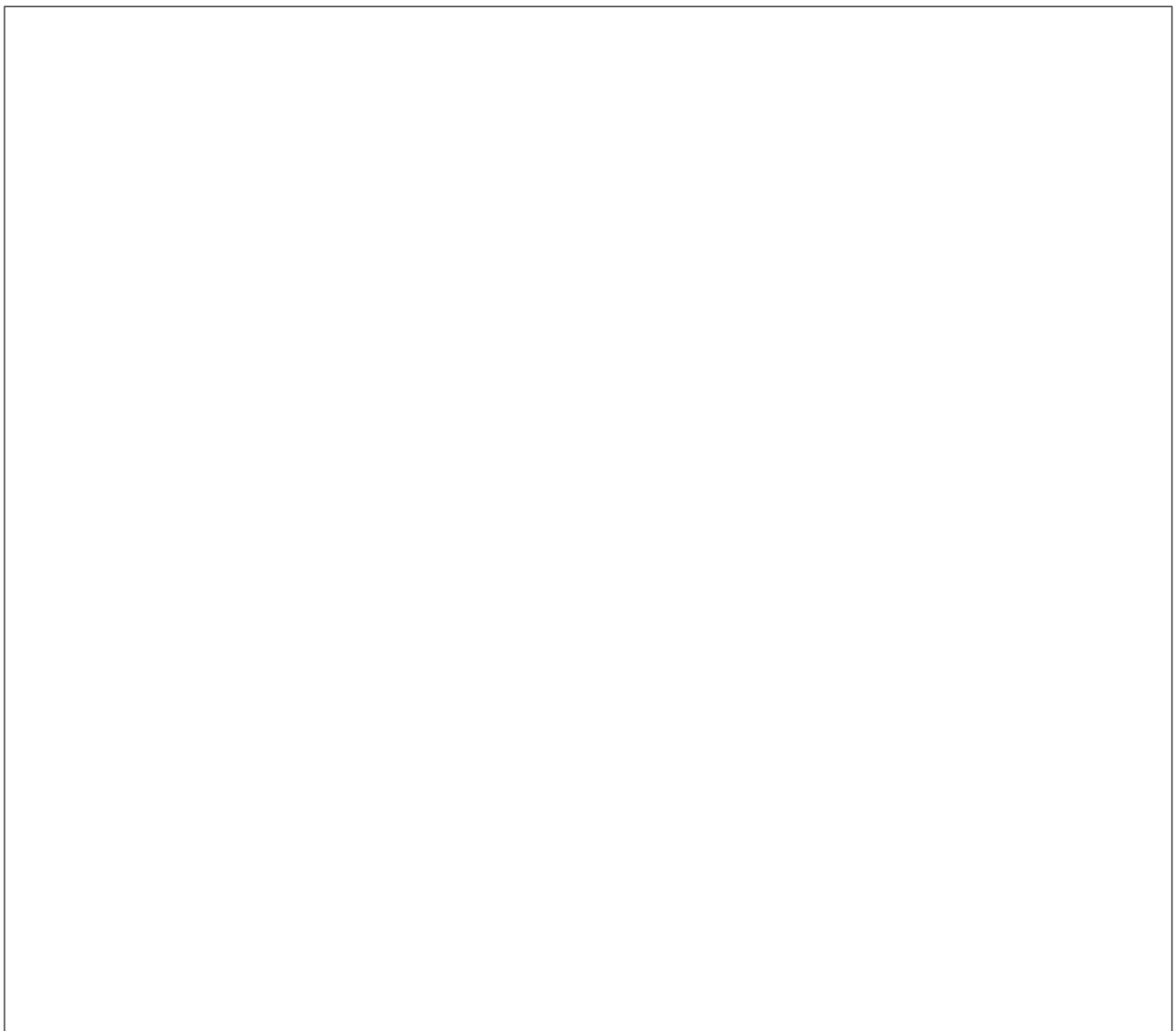
Justification _____

Question 7 (10 marks)

Draw **one** annotated view of your design option based on your chosen visualisation from **part b.** of Question 6. This drawing should be a three-dimensional (3D) pictorial drawing to show what the whole product looks like.

Your response to this question will be assessed against the following assessment criteria.

1	function/suitability and use of visual, tactile and aesthetic parameters in the design option	4 marks
2	four annotations that indicate how the requirements of the design brief have been met	4 marks
3	clarity and detail of drawing	2 marks



Question 8 (4 marks)

Manufacturing a product usually involves joining materials.

Name one specific joining process that you will use in your chosen design option.

Joining process _____

- a.** Describe how you will use this joining process in your design option. In your response, include the equipment used. 2 marks

- b.** Explain why this joining process is the most appropriate for your product. 2 marks

Question 9 (2 marks)

Your finished product has now been tested but it needs to be modified.

Identify a potential problem and explain where it may have occurred in the product design process.

Question 10 (2 marks)

End users are used to seeing labels with care and use instructions on everyday items.

You have designed a product that may be used in a very public setting by a range of end users. Your product has materials and features that may require special instructions for both care and use, warnings about safety and general maintenance, or suggestions relating to its recycling.

Choose **one** of the label templates below and list **two** instructions for the care or use of your product.

 **WARNING**

OR

INSTRUCTIONS

Insert for Section B

Please remove from the centre of this book during reading time.

Design scenario

A number of tennis events are held around the world each year. Melbourne has been chosen to host the International Secondary Schools' Tennis Tournament at Melbourne Park in February 2019.

The Melbourne Park precinct has previously hosted major tennis tournaments that were greatly enjoyed by record crowds and also televised worldwide.

Building on previous successful tournaments, the Melbourne Major Events Corporation is inviting young designers to make their mark on the 2019 International Secondary Schools' Tennis Tournament. They are invited to submit two visualisations and one design option for a product that will feature significant aspects of Victoria and that will appeal to a new generation of tourists visiting Melbourne.

The designs required for the event must:

- include an iconic Victorian landmark
- be original, creative and innovative
- incorporate **two or more** materials, including **one** that is recycled
- be suitable for Melbourne's unpredictable weather.

Select **one** product from the list below.

Product 1

Mobile refreshment cart
<ul style="list-style-type: none">• can easily be moved around the precinct and can be staffed by one person
<ul style="list-style-type: none">• can be securely closed and locked at the end of each day

Product 2

Event staff jacket
<ul style="list-style-type: none">• suitable for a variety of ages, sizes and genders
<ul style="list-style-type: none">• incorporates secure compartments for personal belongings

Product 3

Souvenir game
<ul style="list-style-type: none">• board game
<ul style="list-style-type: none">• must show design feature(s) or element(s) clearly linking the game to the tennis tournament
<ul style="list-style-type: none">• suitable for all ages

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