National Qualifications 2025

X819/77/11 Design and Manufacture

TUESDAY, 13 MAY
1:00 PM – 3:15 PM

Total marks — 80

SECTION 1 — 30 marks

Attempt ALL questions.

SECTION 2 — 50 marks

Attempt ALL questions.

Write your answers clearly in the answer booklet provided. In the answer booklet, you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

Before leaving the examination room you must give your answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.

MARKS

SECTION 1 — 30 marks

Attempt ALL questions

1. During your course you will have analysed the manufacture and performance of a commercial product(s).

Identify a commercial product(s) you have analysed and:

(a) Discuss the suitability of the materials used to manufacture the product(s). **4**

(b) Discuss the suitability of the processes used to manufacture the product(s). **4**

(c) Identify the assembly method(s) used in the product(s) **and** describe the impact they may have on the environment. **3**

(d) Describe the method(s) you used to evaluate the **performance** of the product(s) and the conclusions you reached. **6**

2. During your course you will have researched the evolution of a commercial product(s).

Identify a commercial product(s) you have researched and:

(a) Describe key changes to the product(s) and identify reasons for the changes. **6**

(b) Explain why changes to the product(s) were a success or failure. **3**

(c) Describe the impact the product(s) may have had on society. **2**

(d) Describe how future developments in materials and technologies may influence the evolution of the product(s). **2**

MARKS

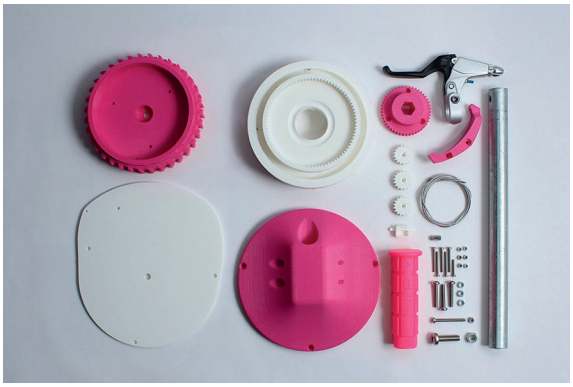
SECTION 2 — 50 marks

Attempt ALL questions

3. The Hand Drive lever attachment helps wheelchair users move more easily. It can be attached to a wheelchair, allowing it to be powered with a rowing motion.

Physiology would have been considered in the design of the Hand Drive.

(a) Describe how physiology may have influenced the design of the Hand Drive. **2**



Modelling was used when developing the Hand Drive.

(b) Describe how modelling could have been used when developing the Hand Drive. **4**

(*You should refer to types **and** purpose of models used*)

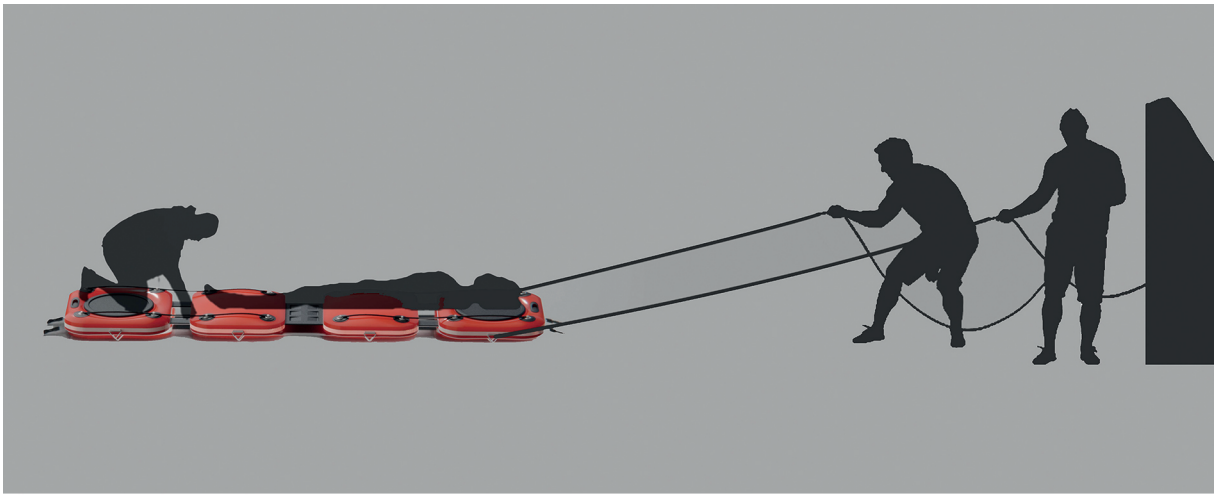
Components of the Hand Drive could be injection moulded or 3D printed.

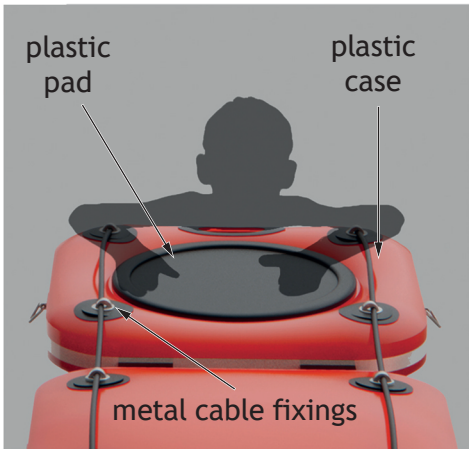
(c) Discuss the issues the manufacturer would consider when choosing between injection moulding and 3D printing. **4**

[Turn over

MARKS

4. The Ice Rescue Board was designed to rescue people trapped on frozen water.





Research would have been carried out when developing the Ice Rescue Board.

(a) Outline the type of information that could be gathered to help the development of the Ice Rescue Board using the following techniques:

- survey of rescue teams
- user trip. **4**

Consideration would have been given to the selection of materials for the components of the Ice Rescue Board.

(b) Discuss the issues that would have influenced the selection of materials for the components of the Ice Rescue Board. **4**

Quality and safety are important to the success of the Ice Rescue Board.

(c) (i) Describe methods that could be used to ensure quality during the production of the Ice Rescue Board. **2**

(ii) Describe methods that could be used to assure customers that the Ice Rescue Board is safe to use. **2**

MARKS

5. The Shell Chair, designed by Marco Sousa Santos, is an example of using biomimicry as an idea-generation technique.

(a) Describe how biomimicry has been used to generate ideas for **two** other products that you are familiar with. **2**

Graphics were used throughout the Shell Chair's development to aid communication between the design team.

(b) Discuss how members of the design team use different graphic techniques to communicate with each other.

You must refer to:

- the type of graphics
- the purpose/information being communicated
- the members of the design team. **6**

The Shell Chair is manufactured using CNC machining.

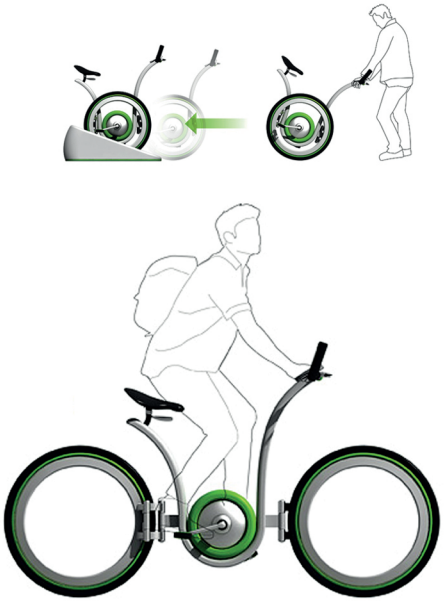
(c) Outline the benefits and drawbacks of using CNC machining to manufacture the Shell Chair. **4**

[Turn over

MARKS

6. The OneBike, designed by Byoung-soo Choi and Jun-kyeong Kim, is an electric bike powered by kinetic energy.

exercise bike and recharge mode



electric bike mode

Advancements in kinetic energy technology created a design opportunity for the OneBike.

(a) Explain other reasons why design opportunities may occur. **4**

(*You should refer to products you are familiar with in your answer*)

It is important for designers of innovative technology, such as the OneBike, to protect their Intellectual Property Rights (IPR).

(b) Describe how different methods of protecting IPR could be used to cover different aspects of the OneBike. **4**

MARKS

7. The BOSCH eco-hub, designed by Batuhan Duran, is a concept that explores how food can be grown in modern homes.

The BOSCH eco-hub is manufactured using sustainable materials, including bio-based plastics and wood that was sustainably sourced.

(a) Discuss the advantages **and** disadvantages of using sustainable materials in products such as the BOSCH eco-hub. **4**

During the development of the BOSCH eco-hub, the designer would have had to resolve conflict between function and aesthetics.

(b) Outline the potential conflicts between function and aesthetics in the BOSCH eco-hub **and** describe how these could be resolved. **4**

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