

# **X211/301**

---

NATIONAL  
QUALIFICATIONS  
2011

TUESDAY, 17 MAY  
1.00 PM – 3.00 PM

PRODUCT DESIGN  
HIGHER

70 marks are allocated to this paper.



Attempt ALL questions.

SECTION A

1.



**Chair A—Ergolife Stool**

Made from solid birch and fabric.

Rolled up length: 400 mm

Diameter: 100 mm

Weight approx 1 kg

Retail price £29.99



**Chair A**



**Chair B—Messenger Bag  
Director's Chair**

Less than 100 mm thick when folded.

Comes with telescoping legs and folding backrest.

Made from aluminium, plastic and nylon mesh seat.

Integrated cup holder and two pockets in the armrests.

Retail price £95

**Chair B**

1. (continued)

- |  |             |
|--|-------------|
| (a) Outline a product specification for the design of <b>one</b> of the chairs.  | 6           |
| (b) Justify the choice of materials used to produce <b>each</b> of these chairs.   | 6           |
| (c) Identify <b>and</b> justify the production methods chosen to manufacture <b>one</b> of the chairs.                         | 6           |
| (d) For both chairs describe the quality assurance issues that would affect:<br>(i) the manufacture;<br>(ii) the consumer.     | 4           |
| (e) For <b>each</b> of the chairs shown, identify a market niche where their use would be appropriate and justify your answer. | 4           |
| (f) Describe the ergonomic issues associated with the use of <b>each</b> of these chairs.                                      | 4           |
| <b>Total for Section A</b>   | <b>(30)</b> |

[Turn over

## SECTION B

2. The teeth in the blade of the cheese grater shown have been manufactured using the process of piercing and blanking.



- (a) **Explain** why piercing and blanking is a suitable process for this type of product. 2
- (b) **State** the name of the process used to form the product. 1
- (c) **State** the name of a suitable metal for the manufacture of this product **and** justify why it is appropriate. 3
- (6)

3. An in-house designer has been asked by Bosch to produce a new product concept for their lawnmower range.



- (a) **Explain** why the designer may prefer an “**open brief**” rather than a “**closed brief**”. 2
- (b) **Describe** the information a designer would gain from an initial meeting with the client. 2

A designer leaves the company during the design of the product.

- (c) **Describe** the “intellectual property rights” issues relating to the design of the product in this situation. 3
- (d) **Describe two** methods that companies can use to protect intellectual property. 2

The rapid prototype model shown in Figure 1 has been produced for testing purposes.

- (e) **State** the name of a suitable rapid prototyping process to address the key features to be tested for the product in Figure 1. 1
- (10)**



**Key Features** to be tested:

- Form and fit testing
- Durability and functional material testing
- Environmental testing
- High stress, heat and chemical resistance testing

Figure 1

[Turn over

4. Two kayaks are shown below.

Figure 2 is produced by a rotational moulded polyethylene.

Figure 3 is produced by traditional methods using glass reinforced plastic.

Rotational moulded Kayak



Figure 2

Glass reinforced plastic Kayak



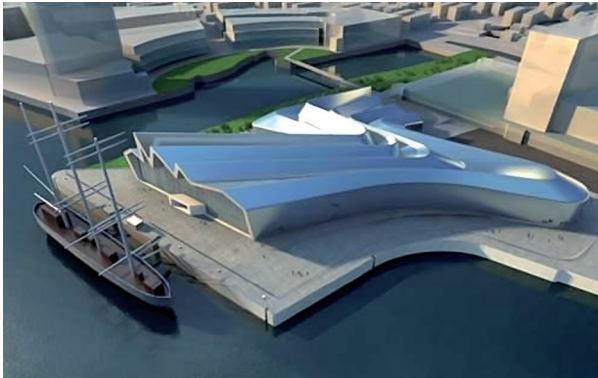
Figure 3

- (a) **Explain** why each method of production is suitable for a product of this type. 4
  - (b) Identify **two** manufacturing disadvantages of using rotational moulding for this product. 2
- (6)



5. The new Glasgow Museum of Transport is due to open this year on the banks of the River Clyde.

“The historical development of the Clyde is a unique legacy. The building is a tunnel-like shed, which is open at opposite ends to the city and the Clyde. It creates a journey from the external into the world of the exhibits. The museum positions itself as open and fluid with its engagement of context and content. The building is conceived as an extrusion open at opposing ends.”



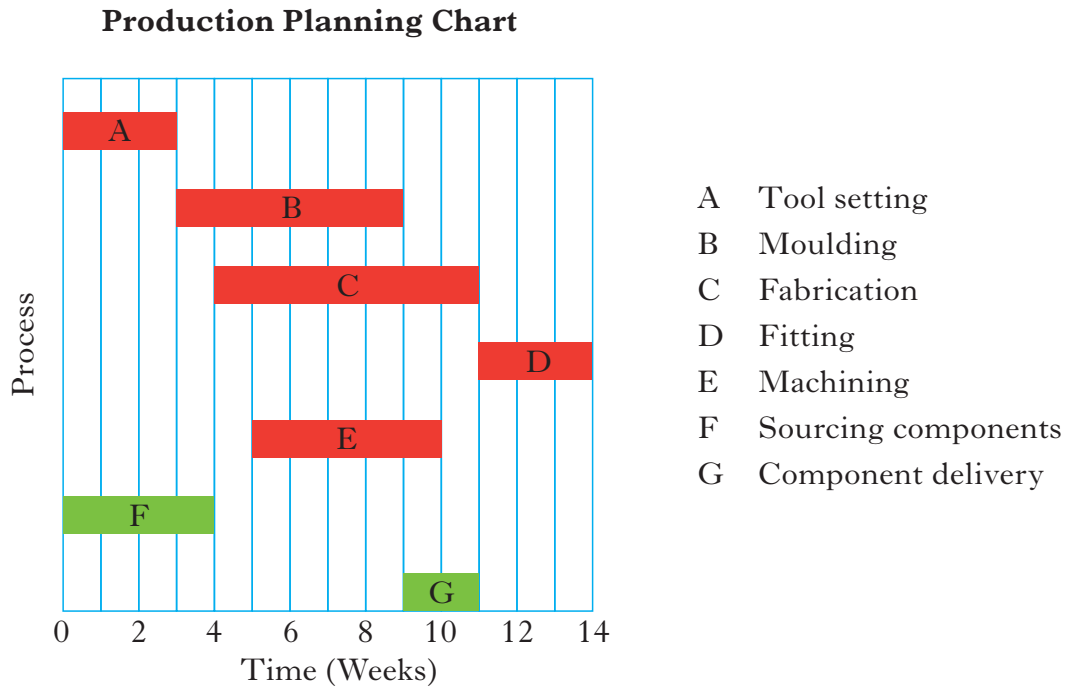
**Describe** how aesthetics have influenced this design.

4

(4)

[Turn over

6. A GANTT chart, similar to the one shown below, was created by the production engineer prior to the manufacture of a product.



- (a) **Describe** the advantages of the GANTT chart in the production planning process. **3**

Some of the component parts of the product may be manufactured by sub-contractors.

- (b) **Explain two** disadvantages of using sub-contractors. **2**
- (c) **Explain** what steps the manufacturer could take to minimise this problem. **2**
- (7)**



7. Two sledges are shown below

**Sledge A—BMW Sauber F1 Sled**

Made from a composite plastic



**Sledge B**

Traditional wooden sledge made from solid birch with metal runners



(a) **Explain** and **justify** the advantages of the composite material used for sledge A over the traditional materials used in sledge B.

4

(b) **Describe** how “form follows function” has influenced the design of sledge A.

3

(7)

**Total for Section B (40)**

[END OF QUESTION PAPER]

## ACKNOWLEDGEMENTS

Question 1 Chair A—Photographs of Ergolife Stol are reproduced by permission of Ergolife UK, Clever Little Ideas Ltd.

Question 3—Images of Bosch lawnmower and prototype are reproduced by kind permission of Bosch Lawn and Garden Ltd.

Question 5—Photographs of Glasgow Museum of Transport are reproduced by kind permission of Zaha Hadid Architects Ltd.

Question 7—Photograph of BMW Sauber F1 Sled is reproduced by kind permission of BMW Group UK.

**[BLANK PAGE]**

**[BLANK PAGE]**