OCR
Oxford Cambridge and RSA

Monday 11 October 2021 – Morning

A Level in Design and Technology: Product Design

H406/01 Principles of Product Design

Time allowed: 1 hour 30 minutes

8950865086

You can use:
- a ruler (cm/mm)
- a scientific calculator
- geometrical instruments

H406/01

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **80**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*****).
- This document has **16** pages.

ADVICE
- Read each question carefully before you start your answer.

Answer **all** the questions.

1 **Fig. 1.1** shows a pair of glasses.

Fig. 1.1

(a) The glasses shown in **Fig. 1.1** have been manufactured with smart materials.

(i) Identify **two** smart materials that could have been used in the manufacture of the glasses to improve their usability and function.

Justify **each** of your answers.

1 .....

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2 .....

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[4]

(ii) Identify and explain **one** negative implication of using smart materials in the manufacture of the glasses.

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..... **[3]**

(iii) Explain **three** ways that the useful life of the glasses could be extended.

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[6]

(b) When conducting market research, 105 people were asked if they wore glasses and/or contact lenses.

The results are shown in **Table 1.2**.

Use	Frequency
Glasses	42
Contact lenses	5
Both	26
None	32

Table 1.2

(i) Use **Table 1.2** to calculate the relative frequency of someone wearing **only** glasses.

Show your working.

Relative frequency .....

[2]

(ii) Use your answer to **part (b) (i)** to find an estimate for the number of people who would wear **only** glasses in a population of 30 000 people.

Estimate for number of people wearing only glasses .....

[1]

(c) Business enterprise could support the designer of the glasses when developing new ideas.

Discuss the role of business enterprise in developing new product ideas.

Refer to specific examples in your answer.

.... **[8]**

2 Restaurants use a variety of single-use packaging for take-away food.

Fig. 2.1 shows a cold drink in a take-away cup, with a lid and straw.

Fig. 2.1

(a) Since the reduction of the use of polymers in single-use packaging, designers and manufacturers have had to seek alternative modern materials.

(i) Identify a suitable **modern** material for the cup shown in **Fig. 2.1**.

Justify your answer.

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..... **[2]**

(ii) Explain **one** disadvantage of using the modern material identified in **part (a) (i)** for the cup.

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..... **[2]**

(b) **Fig. 2.2** shows an isometric drawing of a burger carton shape.

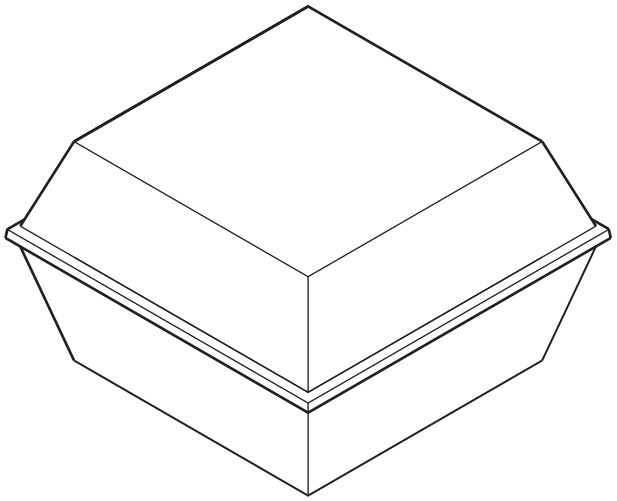
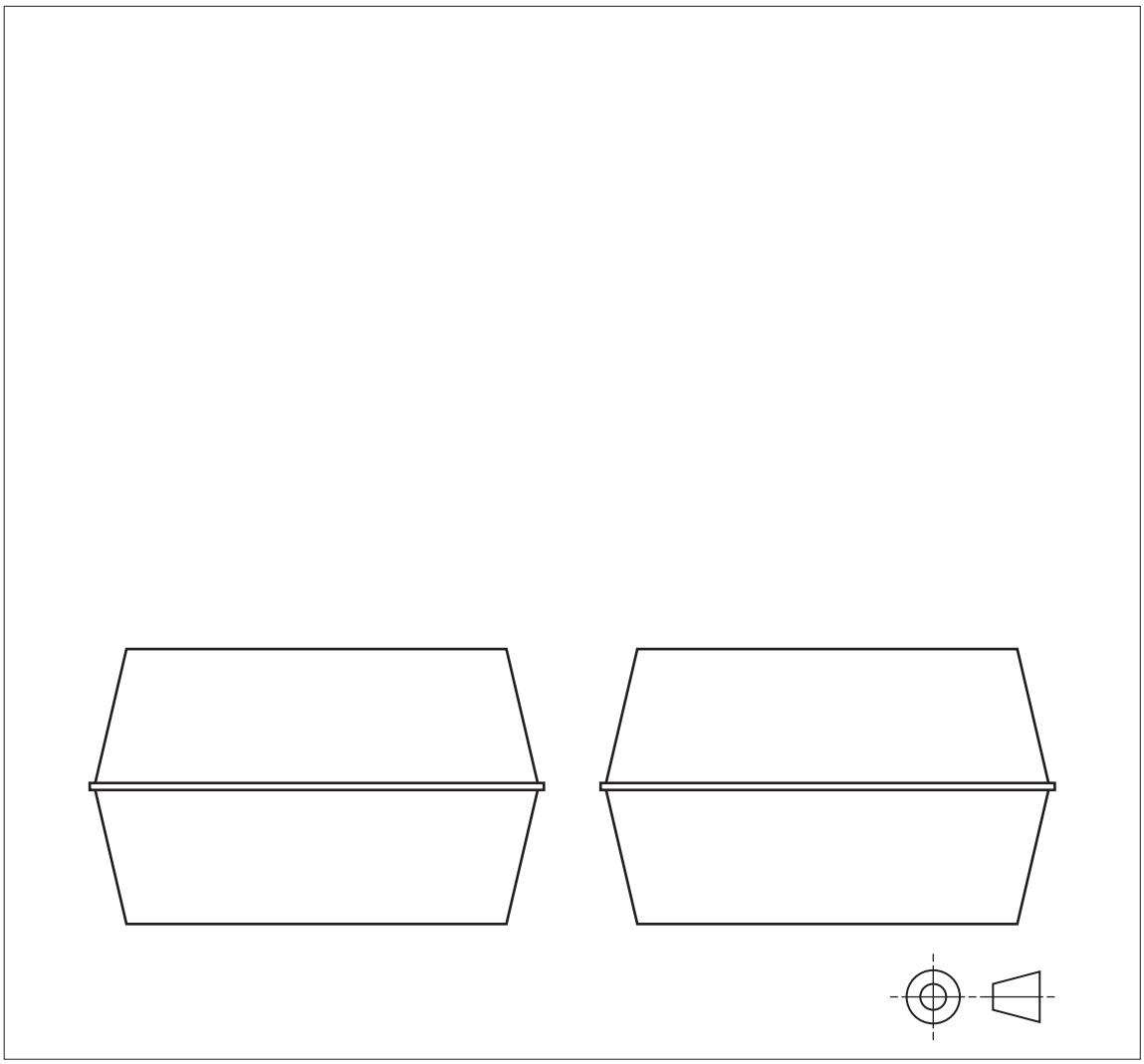


Fig. 2.2

(i) Complete the third angle orthographic projection drawing by drawing the top view of the burger carton shown in **Fig. 2.2**.



[5]

(ii) **Fig. 2.3** shows some of the burger carton measurements.

Fig. 2.4 shows an enlarged image of a bottom corner of the burger carton.

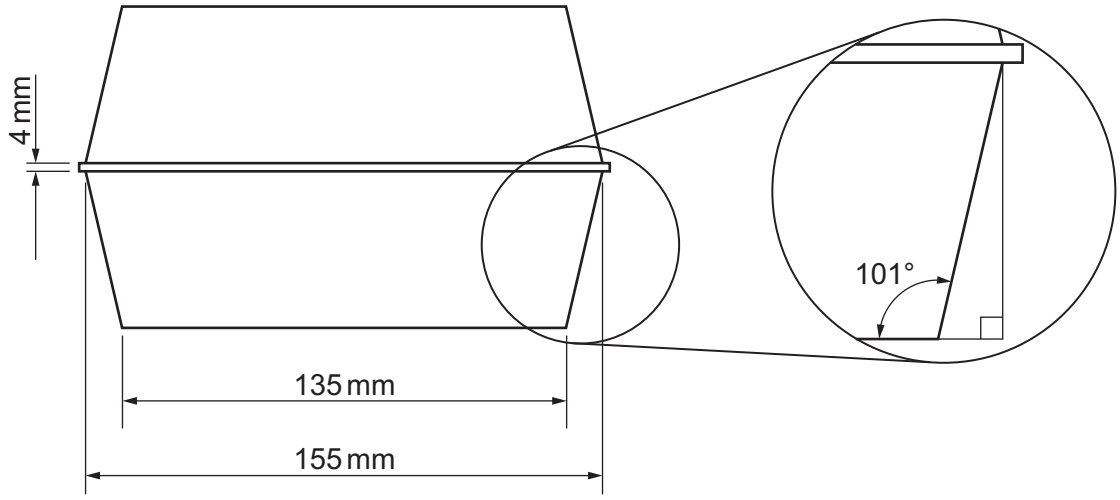


Fig. 2.3
(not to scale)

Fig. 2.4

Calculate the height of the burger carton in mm to 2 decimal places. Show your working.

Height of burger carton ..... mm

[6]

(c) **Fig. 2.5** shows three sizes of disposable cups for hot drinks. The cups are manufactured from double walled paper board lined with polyethylene and have removable polystyrene lids.

small medium large

Fig. 2.5

(i) Identify a feature of the cups shown in **Fig. 2.5** that make them suitable for hot drinks.

Justify your answer.

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..... **[2]**

(ii) The small cup holds 240 ml and the medium cup holds 360 ml.

Calculate the ratio of the small to medium cup in its simplest form.

Ratio .....

[1]

(iii) The ratio of the large to medium cup is the same ratio as the small to medium cup.

Calculate the volume that the large cup holds in ml. Show your working.

Volume ..... ml

[2]

3 It is the responsibility of the manufacturer to incorporate labels relating to safety in their products.

(a) Give **one** example of a symbol relating to safety that you would expect to find on a label for **each** of the products below. Justify **each** of your answers.

Electrical item .....

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Aerosol can .....

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[4]

(b)* The regulatory and legislative framework in the Health and Safety at Work Act (HASAW) sets out duties of employers and employees.

Discuss the implications for manufacturers of health and safety legislation.

Refer to specific examples in your answer.

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4 **Fig. 4.1** shows a metal frying pan.

The metal frying pan is made from two main parts which are permanently joined during manufacture.

Fig. 4.1

(a) Describe **two** features of the frying pan shown in **Fig. 4.1** that improve its functionality.

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2 .....

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[4]

(b) Identify a non-ferrous metal that is used in the manufacture of the frying pan.

Justify your answer.

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..... **[2]**

(c) The frying pan shown in **Fig. 4.1** is manufactured as a batch of 1000 from a non-ferrous metal.

(i) Use annotated sketches and/or notes to show how **part A** would be manufactured.

Identify any relevant specialist tooling and quality control checks. **[5]**

(ii) Use annotated sketches and/or notes to show how **part B** would be manufactured and **permanently joined** to **part A**.

Identify any relevant specialist tooling and quality control checks. **[5]**

(d) Describe **one** physical test that the frying pan would undergo to test performance.

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..... **[2]**

(e) The designer of the frying pan used digital design software in the development of the design.

Discuss the role of digital design software during design development.

Refer to specific examples in your answer.

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END OF QUESTION PAPER