

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

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
plus your additional time allowance**

YOU CAN USE:

a ruler (cm/mm)

a scientific calculator

geometrical instruments

Please write clearly in black ink.

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

First name(s)

Last name

READ INSTRUCTIONS OVERLEAF



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 (*).

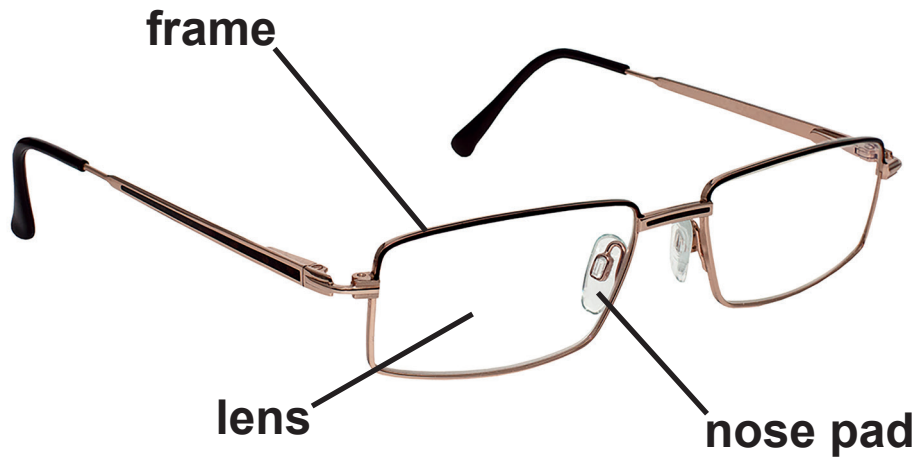
ADVICE

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 _____

2 _____

[4]

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

[3]

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

1 _____

2 _____

3 _____

[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.

TABLE 1.2

Use	Frequency
Glasses	42
Contact lenses	5
Both	26
None	32

- (i) Use TABLE 1.2 to calculate the relative frequency of someone wearing **ONLY** glasses. [2]

Show your working.

<p>Relative frequency _____</p>

- (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. [1]

Estimate for number of people wearing only glasses _____

- (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]

[illegible]

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.

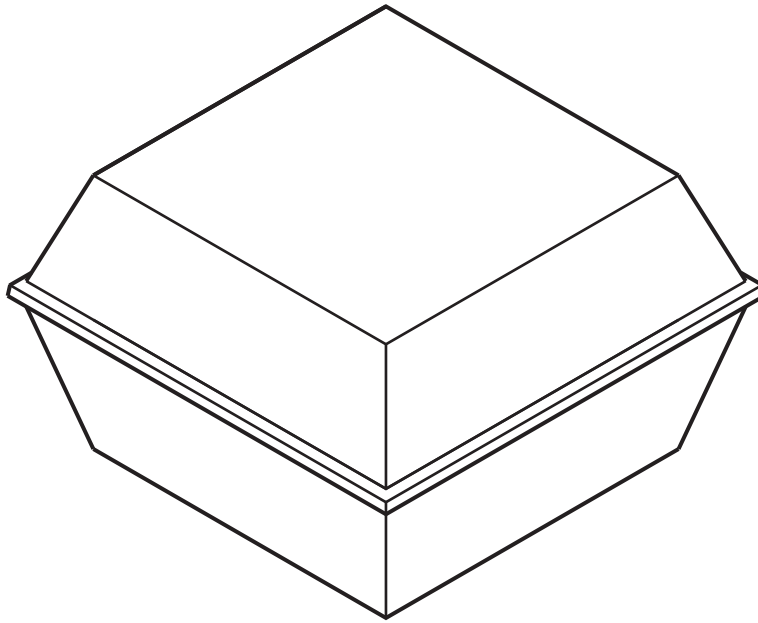
[2]

(ii) Explain ONE disadvantage of using the modern material identified in PART (a) (i) for the cup.

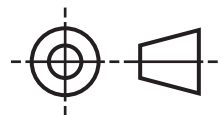
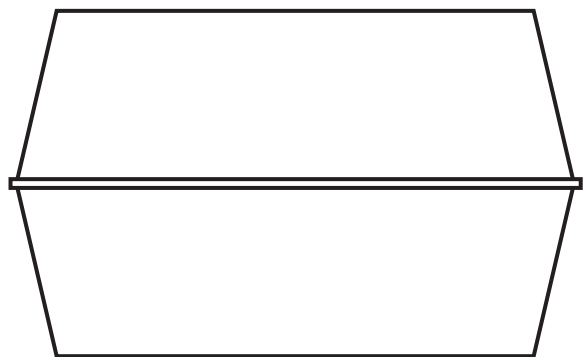
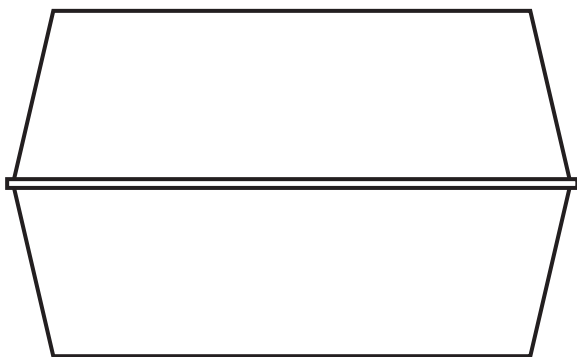
[2]

(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 opposite shows some of the burger carton measurements.

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

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

[6]

Height of burger carton _____ mm

FIG. 2.3
(not to scale)

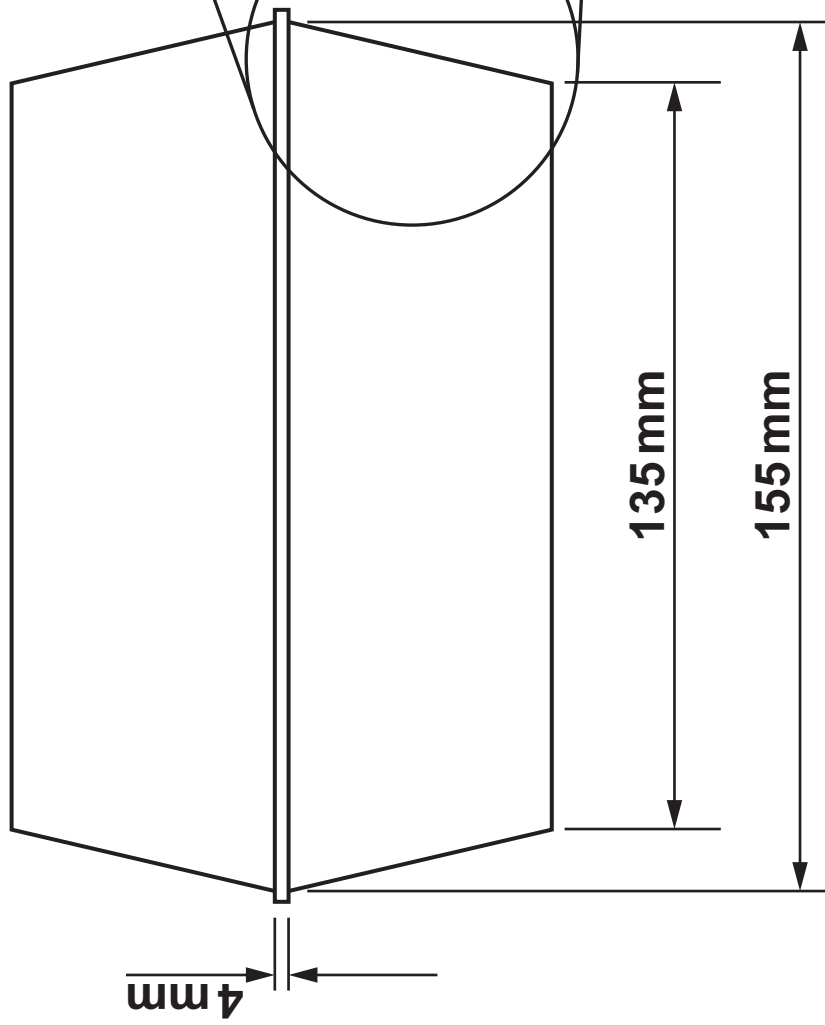
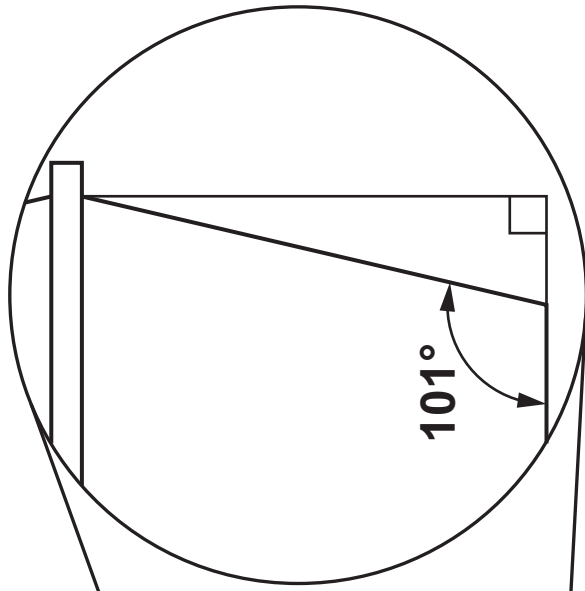


FIG. 2.4



- (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.

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.

[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. [1]

<p style="text-align: right;">Ratio _____</p>

- (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. [2]

<p style="text-align: right;">Volume _____ ml</p>

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 _____

Aerosol can _____

_____ [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. [8]

[illegible]

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.

1 _____

2 _____

[4]

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

Justify your answer.

[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.

[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. [6]

END OF QUESTION PAPER



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