OCR
Oxford Cambridge and RSA

Monday 2 June 2025 – Morning

A Level in Design and Technology: Product Design

H406/01 Principles of Product Design

Time allowed: 1 hour 30 minutes

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

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.

1 Metal toy cars are popular with children and also as collectable items.

Fig. 1 shows a batch produced toy car in use and a collectable toy car.

Fig. 1

(a) Identify a suitable manufacturing process for the body of metal toy cars of this type.

Justify your answer.

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

(b) Explain **two** ways that the metal toy cars, shown in **Fig. 1**, have been designed for upgrades and/or recycling.

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[4]

(c) Children's toys such as the metal toy cars need to be checked for safety and quality before distribution.

Identify and explain **two** methods that manufacturers use to protect and assure consumers.

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[6]

(d) The metal toy cars shown in **Fig. 1** are replicas of full-sized motor cars.

Identify and explain **three** intellectual property considerations that the manufacturer **must** take into account when creating designs for replica metal toy cars.

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[6]

(e) Influential movements and related designers have inspired the creation of many products we use today.

Discuss the influence of key historical movements on the development of designs.

Use examples of historical movements in your answer.

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..... **[8]**

2 **Fig. 2.1** shows an inkjet printer used with desktop computers within home environments.

Fig. 2.1

(a) Identify and describe **two** ways in which the printer manufacturer could have used enterprise to drive the development of its product.

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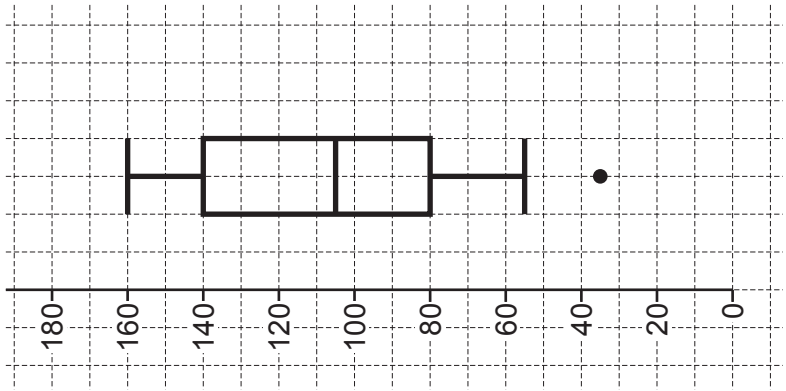
[4]

(b) Variations have been found in how much ink a cartridge holds.

4100 cartridges were tested to see how many pages could be printed before they needed replacing.

The results are shown in the box plot (**Fig. 2.2**) below:

Fig. 2.2



(i) Use **Fig. 2.2** to state the **median** number of pages that could be printed from the cartridges.

..... **[1]**

(ii) There is a black dot at 35. What does the black dot represent?

..... **[1]**

(iii) Calculate how many cartridges printed **at least** 80 pages. Show your working. **[2]**

Number of cartridges .....

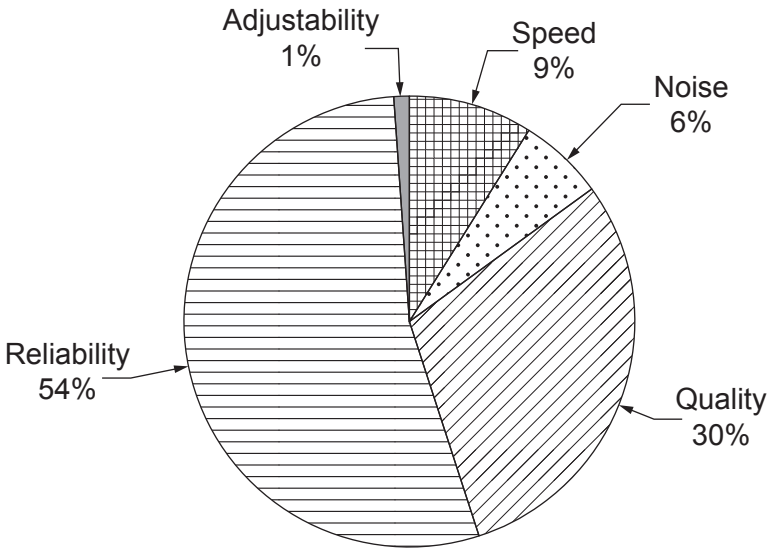
(iv) Use **Fig. 2.2** to state the upper quartile of the number of pages that could be printed from the cartridges.

..... **[1]**

(c) A survey of 6500 people was conducted. People were asked which was the most important feature of their inkjet printer.

The results are shown in **Fig. 2.3** below:

Fig. 2.3



(i) Calculate the number of people that selected **adjustability** or **speed** as their most important feature. Show your working. **[3]**

Number of people .....

(ii) Calculate the angle of the **noise** segment of the pie chart. Show your working. **[2]**

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(iii) Calculate the ratio of the people that selected **quality** to the total number of people asked. Show your working and the ratio in its simplest form. **[2]**

Ratio .....

(iv) Calculate the fraction of people that selected **reliability**. Show your working and the fraction in its simplest form. **[2]**

Fraction .....

3 Awareness of climate change and pollution has led to the development of alternative sustainable materials.

(a) Identify a biodegradable material. Explain **one** advantage and **one** disadvantage of using this material in a product.

Biodegradable material: .....

Advantage .....

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Disadvantage .....

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[3]

(b)* Discuss the implications and opportunities of using sustainable materials in products.

Use specific examples of sustainable materials and products in your answer.

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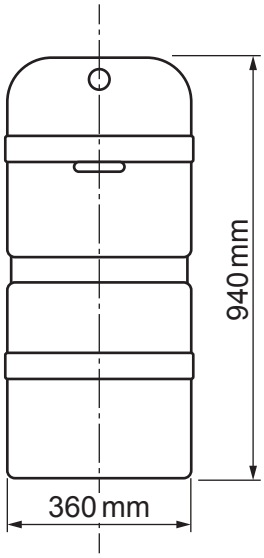
4 **Fig. 4.1** shows a rainwater container. The container has a downpipe which collects water off a roof.

Fig. 4.2 shows a view of the rainwater container. The lid and stand are not shown.

Fig. 4.1

Fig. 4.2



(not to scale)

(a)

(i) Identify a suitable thermopolymer for the rainwater container.

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(ii) The material of the rainwater container could deteriorate from exposure to the weather.

Describe how this could be prevented.

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

(b) The rainwater container is hollow and is manufactured as a batch of 10 000.

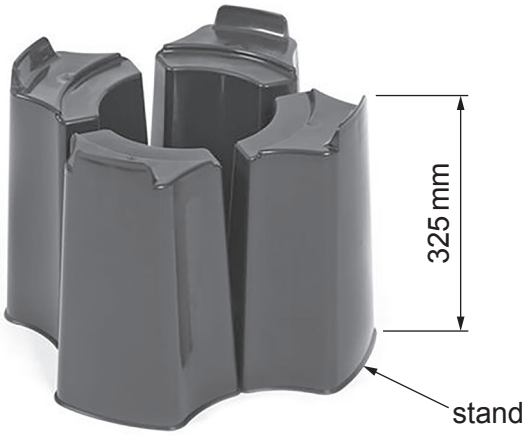
(i) Use annotated sketches and/or notes to show how the **rainwater container** could be manufactured.

Identify any relevant specialist tooling and quality control checks. **[8]**

(ii) Use annotated sketches and/or notes to show how the **stand** shown in **Fig. 4.1** could have been designed to optimise the use of material.

An image of the stand is repeated in **Fig. 4.3** below.

Fig. 4.3



(not to scale)

[5]

(c) The manufacturer needs to create a hole in the rainwater container for the tap.

The tap requires a 35 mm diameter hole.

The rainwater container is 3 mm thick.

Calculate the volume of material in mm^3 that is removed. Show your working and give your answer to the nearest cubic millimetre. **[3]**

Volume of material removed ..... mm^3

(d) Discuss the implications of the Health and Safety at Work Act for the manufacturer of the rainwater container.

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END OF QUESTION PAPER