Paper Reference(s) 9DT0/01
Pearson Edexcel Level 3 GCE

Design and Technology (Product Design)

Advanced

COMPONENT 1

Total Marks

Time: 2 hours 30 minutes

In the boxes below, write your name, centre number and candidate number.

Surname						
Other names						
Centre Number						
Candidate Number						

Pearson

YOU MUST HAVE

A calculator and a ruler

YOU WILL BE GIVEN

Diagram Booklet

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the spaces provided in this Question Paper or in the separate Diagram Booklet – there may be more space than you need.

For questions requiring mathematics, you must **show all your working out** with **your answer clearly identified** at the **end of your solution.**

INFORMATION

The total mark for this paper is 120.

The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.

There may be spare copies of some diagrams.

ADVICE

Read each question carefully before you start to answer it.

Try to answer every question.

Check your answers if you have time at the end.

Answer ALL questions. Write your answers in the spaces provided.

1 Look at Figure 1 for Question 1 in the Diagram Booklet. It shows a sink made from stainless steel.

(a) Stainless steel is an alloy of iron, carbon and other metals.

Name TWO other metals that can be alloyed with iron and carbon to make stainless steel.
(2 marks)

1 _____

_____

_____

2 _____

_____

_____

(continued on the next page)

1 continued.

(b) Stainless steel has been used because the sink needs to be strong and durable.

Explain TWO further working properties of stainless steel that make it a suitable material for the sink when used for food preparation and dishwashing.
(4 marks)

1 _____

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_____

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_____

2 _____

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_____

(continued on the next page)

1 continued.

(continued on the next page)

1 continued.

(c) Look at Figure 2 for Question 1(c) in the Diagram Booklet. It shows a sink plug.

The sink plug is made out of rubber.

Explain ONE reason why rubber is a suitable material for the sink plug.

(3 marks)

(Total for Question 1 = 9 marks)

2 Look at Figure 3 for Question 2 in the Diagram Booklet. It shows a drawing of a component that is to be manufactured for use in a consumer product. The component is to be milled from a solid block of aluminium.

(a) State TWO other methods for producing the component from aluminium.
(2 marks)

1 _____

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_____

2 _____

_____

_____

(continued on the next page)

2 continued.

(b) The original solid block of aluminium was 135 mm × 30 mm × 45 mm and had a mass of 492 g.

Calculate the mass of the finished milled component.

Give your answer in grammes (g) to 1 decimal place.

Show all of your workings.
(5 marks)

(continued on the next page)

2 continued.

Answer _____ g

(Total for Question 2 = 7 marks)

3 Look at Figure 4 for Question 3 in the Diagram Booklet. It shows a fizzy drinks bottle manufactured from polyethylene terephthalate (PET).

Polyethylene terephthalate (PET) can be blow moulded.

(a) Explain ONE other property of polyethylene terephthalate (PET) that makes it suitable for the fizzy drinks bottle.
(2 marks)

(continued on the next page)

3 continued.

(b) Describe, using labelled sketches, the blow moulding process used to produce the bottle. (4 marks)

(continued on the next page)

3 continued.

(continued on the next page)

3 continued.

(c) Explain TWO reasons why blow moulding has been used for the production of the bottle.
(6 marks)

1 _____

(continued on the next page)

3 continued.

2

(Total for Question 3 = 12 marks)

4 A manufacturer of consumer goods is considering replacing some of its products with new and repurposed designs. This requires a lot of planning, preparation and evaluation.

(a) Critical path analysis is a planning method.

Give THREE features of critical path analysis. (3 marks)

1 _____

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2 _____

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3 _____

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(continued on the next page)

4 continued.

(b) Manufacturers need to undertake financial forecasts which include the preparation of budgets.

Outline considerations that need to be taken into account when preparing budgets.
(6 marks)

(continued on the next page)

4 continued.

(continued on the next page)

4 continued.

(c) A trademark allows a manufacturer to provide easy identification of their genuine products.

Give TWO forms a trademark may take to identify the genuine product.
(2 marks)

1 _____

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2 _____

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(continued on the next page)

4 continued.

(d) Discuss cost, sales, profit and market implications to the manufacturer during the various stages of a product's life cycle.
(9 marks)

(continued on the next page)

4 continued.

(continued on the next page)

4 continued.

(continued on the next page)

4 continued.

(Total for Question 4 = 20 marks)

5 A manufacturer has been commissioned to produce a solid sphere with a volume of 10 litres. The volume of a sphere can be calculated using the following formula:

$$V = (4\pi r^3)/3$$

(a) Calculate the radius of the sphere.

1 litre = 1000 cm^3

Give your answer in cm to 2 decimal places.
(5 marks)

Answer _____ cm

(continued on the next page)

5 continued.

(b) The sphere is to be made from aluminium which has a density of 2·7 tonnes per m^3.

Calculate the mass of the 10 litre sphere in kilogrammes (kg).

1 tonne = 1000 kilogrammes (kg)

Use mass (M) = volume (V) × density (d)

(3 marks)

Answer _____ kg

(Total for Question 5 = 8 marks)

6 Look at Figure 5 for Question 6 in the Diagram Booklet. It shows a wood joint that is to be used on a single piece of furniture. The joint will be positioned and marked out using a pencil and other marking out tools.

(a) Name TWO other marking out tools used to position and mark out the joint accurately and efficiently.
(2 marks)

1 _____

_____

_____

2 _____

_____

(continued on the next page)

6 continued.

(b) The manufacturer has received an order for 50 identical pieces of furniture.

Explain TWO reasons why batch production would be used for the manufacturing of the furniture.
(6 marks)

1

(continued on the next page)

6 continued.

2

(continued on the next page)

6 continued.

(c) The furniture is manufactured and finished in a small workshop environment.

Discuss the significance of health and safety laws and regulations to the manufacturer of the furniture.
(6 marks)

(continued on the next page)

6 continued.

(continued on the next page)

6 continued.

(continued on the next page)

6 continued.

Each piece of furniture will be sold with separate padded cushions that have textile covers.

(d) Name TWO natural fibre textiles that could be used for the cushion covers.
(2 marks)

1 _____

_____

_____

2 _____

_____

_____

(continued on the next page)

6 continued.

(e) The textile fabric is in rolls 500m long by 1·3m wide. Each cushion cover requires a single piece of fabric 0·45m by 0·85m.

Calculate the maximum number of cushion covers that can be manufactured from one roll.
(3 marks)

Answer _____

(Total for Question 6 = 19 marks)

7 **Look at Figure 6 for Question 7 in the Diagram Booklet. It shows a component drawn in 3rd angle orthographic projection (not to scale).**

Designers use a range of different drawing techniques to convey their design ideas.

Look at the isometric grid for Question 7 in the Diagram Booklet.

Draw an accurate isometric projection of the component.

Use the isometric grid in the Diagram Booklet, starting with line A–B as your front corner.

Each segment of the grid equals 10mm.

Dimensioning of the isometric projection is NOT required.
(6 marks)

(Total for Question 7 = 6 marks)

8 **Look at Figures 7 and 8 for Question 8 in the Diagram Booklet. They show external and internal views of The Red House which was the vision of William Morris and became the centre of his Arts and Crafts movement.**

Discuss the style and design philosophy of the Arts and Crafts movement and how it may have influenced the house design shown in Figures 7 and 8.
(9 marks)

(continued on the next page)

8 continued.

(continued on the next page)

8 continued.

(Total for Question 8 = 9 marks)

9 Look at Figure 9 for Question 9 in the Diagram Booklet. It shows a modern smart watch that offers a wide range of functions such as fitness tracking, health monitoring, calendars and music.

Discuss how modern technology and miniaturisation of components have enabled the development of smart watches.
(9 marks)

(continued on the next page)

9 continued.

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9 continued.

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9 continued.

(Total for Question 9 = 9 marks)

10 **Photo-chromic lenses are becoming a popular choice for people who wear glasses to correct their eyesight.**

Explain THREE advantages to the user of purchasing glasses with photo-chromic lenses rather than standard lenses.
(9 marks)

1

(continued on the next page)

10 continued.

2

3

(continued on the next page)

10 continued.

(Total for Question 10 = 9 marks)

11 Look at Figure 10 for Question 11 in the Diagram Booklet. It shows a reclining armchair and footstool.

The chair has a steel frame and reclining mechanism, laminated beech base and legs, and flame resistant foam cushions that are covered in leather.

Evaluate the performance of the reclining armchair and footstool with reference to aesthetics and user requirements.
(12 marks)

(continued on the next page)

11 continued.

(continued on the next page)

11 continued.

(continued on the next page)

11 continued.

(continued on the next page)

11 continued.

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11 continued.

(Total for Question 11 = 12 marks)

TOTAL FOR PAPER = 120 MARKS

END OF PAPER