

Design and Technology
(Product Design)
Advanced
COMPONENT 1

Total Marks

Wednesday 7th June – Afternoon

Time: 2 hours 30 minutes

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

Surname					
Other names					
Centre Number					
Candidate Number					

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 wardrobe that is supplied in flat-pack form for self-assembly at home.**

- (a) Knock-down fittings will be used during the home assembly of the flat-pack wardrobe.**

**Name TWO knock-down fittings that could be used for assembling the flat-pack wardrobe.
(2 marks)**

1 _____

2 _____

(continued on the next page)

1 continued.

- (b) The wardrobe is made from chipboard. A thin veneer of hardwood has been applied to the surface of the chipboard.**

Explain TWO characteristics of veneered chipboard that make it a suitable material for flat pack wardrobes.

(4 marks)

Answer space continues on the next page.

1 _____

1(b) continued.

2 _____

(continued on the next page)

1 continued.

- (c) Explain one DISADVANTAGE of using veneered chipboard for the wardrobe.
(3 marks)**

(Total for Question 1 = 9 marks)

- 2 Look at Figure 2 for Question 2 in the Diagram Booklet. It shows a packing case used in the transportation and delivery of consumer products.**

The packing case is folded from a single piece of board in the form of a net.

- (a) State TWO types of board that would be suitable for making the packing case.
(2 marks)**

1 _____

2 _____

(continued on the next page)

2 continued.

- (b) The graphics on the packing case will be printed using black ink.**

Each packing case requires 2·5 ml of ink.

Ink is supplied in 1·5 litre containers.

The manufacturer needs to print graphics on 3,500 packing cases.

The manufacturer buys sufficient full containers of ink to complete the print run.

**Calculate how many extra packing cases the manufacturer could print before running out of ink.
(5 marks)**

Answer space continues on the next page.

2(b) continued.

Answer _____ cases

(Total for Question 2 = 7 marks)

- 3 Look at Figure 3 for Question 3 in the Diagram Booklet. It shows an organiser that has been vacuum formed.**

Vacuum forming requires a mould, in the form of the finished product, to be made for use in the manufacturing process.

One feature of the mould is that there are no undercuts that would lock the plastic around the mould and prevent its removal.

- (a) Explain ONE other feature of the mould that improves/aids productivity and quality.
(2 marks)**

(continued on the next page)

3 continued.

- (b) Describe the vacuum forming process, using annotated sketches.
(4 marks)**

(continued on the next page)

3 continued.

**(c) Explain two DISADVANTAGES of the vacuum forming process.
(6 marks)**

Answer space continues on the next page.

1 _____

3(c) continued.

2 _____

(Total for Question 3 = 12 marks)

4 Manufacturers use project management strategies such as scrum when designing and developing new products and production systems.

**(a) Give the THREE roles within the scrum team.
(3 marks)**

1 _____

2 _____

3 _____

(continued on the next page)

4 continued.

**(b) Outline the key features of the scrum process.
(6 marks)**

Answer space continues on the next page.

4(b) continued.

(continued on the next page)

4 continued.

- (c) Products need to be protected to prevent other manufacturers making exact copies of the form and function of the product.**

**Give TWO methods of protecting the form and function of the product.
(2 marks)**

1 _____

2 _____

(continued on the next page)

4 continued.

- (d) Discuss how the design and manufacture of consumer products can minimise the impact of the products on the natural environment.
(9 marks)**

Answer space continues on the next 3 pages.

4(d) continued.

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(Total for Question 4 = 20 marks)

- 5 Look at Figure 4 for Question 5 in the Diagram Booklet. It shows a table of sales for different styles of car.**

The information is to be presented in the form of a pie chart.

- (a) Calculate the sector angle for the three car types.**

You must show your answer correct to 1 decimal place.

(6 marks)

Sector angle hatchback _____°

Sector angle saloon _____°

Sector angle SUV _____°

(continued on the next page)

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5 continued.

(b) The prices of the cars are:

Hatchback – £ 24,500

Saloon – £ 32,400

SUV – £ 43,900

Calculate the mean sales price for the car sales shown in Figure 4.

(2 marks)

Answer £ _____

(Total for Question 5 = 8 marks)

6 Look at Figure 5 for Question 6 in the Diagram Booklet. It shows a speedboat with a teak deck and a glass fibre (GRP) hull.

(a) The teak deck has been coated with a varnish.

**Give TWO benefits of using varnish on the deck of the boat.
(2 marks)**

1 _____

2 _____

(continued on the next page)

6 continued.

- (b) Explain TWO benefits of a boat hull that is made from GRP.
(6 marks)**

Answer space continues on the next page.

1 _____

6(b) continued.

2 _____

(continued on the next page)

6 continued.

- (c) The speedboat is produced to order in a small modern manufacturing facility using one-off production methods.**

**Discuss the characteristics and applications of quality assurance and quality control as they would apply to the manufacture of the speedboat.
(6 marks)**

Answer space continues on the next page.

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6(c) continued.

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6 continued.

Health and safety is very important to ensure the safety of the workforce.

**(d) Name TWO key pieces of health and safety legislation that would protect the workforce during the manufacture of the speedboat.
(2 marks)**

1 _____

2 _____

(continued on the next page)

6 continued.

- (e) The speedboat has undergone sea trials to test its performance and efficiency.**

At its maximum speed of 90 km/hour the speedboat uses 13·62 litres of fuel per hour.

Calculate the cost of the fuel required for a 25 km journey at maximum speed.

**Fuel costs £1·65 per litre.
(3 marks)**

Answer space continues on the next page.

6(e) continued.

Answer £ _____

(Total for Question 6 = 19 marks)

- 7 Look at Figure 6 for Question 7 in the Diagram Booklet. It shows an isometric projection of a component.**

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

Look at the grid for Question 7 in the Diagram Booklet. Draw an accurate 3rd angle orthographic projection of the component.

Use the grid provided at a scale of 1 square = 1 cm.

You should start at line A–B which has been shown for both the front and side elevation.

You must include sufficient dimensions on your drawing to allow a 3rd party to produce the component.

(6 marks)

(Total for Question 7 = 6 marks)

8 Look at Figure 7 for Question 8 in the Diagram Booklet. It shows a pencil sharpener designed by Raymond Loewy.

**Discuss the style and design philosophy of the Streamlining Movement and how it may have influenced the design of the pencil sharpener in Figure 7.
(9 marks)**

Answer space continues on the next 3 pages.

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(Total for Question 8 = 9 marks)

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9 Manufacturers utilise a number of systems when manufacturing consumer products.

**Discuss the benefits to the manufacturer of quick response manufacturing (QRM).
(9 marks)**

Answer space continues on the next 4 pages.

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(Total for Question 9 = 9 marks)

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10 Quantum tunnelling composites are now widely used as inputs to electronic products.

**Explain THREE uses of quantum tunnelling composites in electronic products.
(9 marks)**

Answer space continues on the next 2 pages.

1 _____

10 continued.

2 _____

10 continued.

3 _____

(Total for Question 10 = 9 marks)

11 Look at Figure 8 for Question 11 in the Diagram Booklet. It shows a bedside lamp.

- **The lamp can be switched on or off by touching either the base or tubular support.**
- **Three levels of lighting are available, by touching the base or support one, two, or three times.**
- **The lamp switches off after the fourth touch of the base or support.**
- **The lamp can use either LEDs or halogen bulbs.**
- **The base is made out of stainless steel and has rubber on the underside.**
- **The lamp weighs 2.7 kg.**
- **The overall height of the lamp is 330 mm.**
- **The diameter of the lamp base and shade is 130 mm.**

Evaluate the functionality of the bedside lamp with reference to aesthetics and user requirements within a home setting.

(12 marks)

Answer space continues on the next 5 pages.

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(Total for Question 11 = 12 marks)

TOTAL FOR PAPER = 120 MARKS
END OF PAPER