

Design and Technology
COMPONENT 1: Polymers

Total Marks

Monday 19 June 2023 – Morning

Time: 1 hour 45 minutes

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

Surname					
Other names					
Centre Number					
Candidate Number					

YOU MUST HAVE

calculator, ruler, writing and drawing equipment, protractor, pair of compasses

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.

Calculators may be used.

Any diagrams may NOT be accurately drawn, unless otherwise indicated.

You must show all your working out with your answer clearly identified at the end of your solution.

Turn over

INFORMATION

The total mark for this paper is 100.

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.

SECTION A

Core

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

- 1 (a) The materials that products are made from are chosen because of their properties.**

Look at Figure 1 for Question 1(a) in the Diagram Booklet. It shows a table of products.

For each of the products shown, give a property of the material it is made from that makes the material suitable for the product.

(4 marks)

The first one has been done for you.

(continued on the next page)

Turn over

1 continued.

A printing company wants to use a new and emerging technology. It operates as a privately-owned business.

**(b) (i) Explain ONE advantage for the company of operating as a privately-owned business.
(2 marks)**

(continued on the next page)

Turn over

1(b) continued.

The printing company has invested £150,000 of its own money to buy new and emerging technology but wants to raise an additional 30% by crowdfunding.

- (ii) Calculate how much additional money it will raise by crowdfunding.
(2 marks)**

Answer £ _____

(Total for Question 1 = 8 marks)

Turn over

2 Look at Figure 2 for Question 2 in the Diagram Booklet. It shows a concrete candle holder.

**(a) Name the drawing method that has been used to show the concrete candle holder in Figure 2.
(1 mark)**

**(b) Explain ONE reason for using concrete for the candle holder.
(2 marks)**

(continued on the next page)

Turn over

2 continued.

Look at Figure 3 for Question 2(c) in the Diagram Booklet. It shows a standardised size of candle.

- (c) Explain ONE reason for manufacturing the concrete candle holder to hold a standardised size of candle.
(2 marks)**

(continued on the next page)

2 continued.

Look at Figure 4 for Question 2(d) in the Diagram Booklet. It shows a dimensioned drawing of the concrete candle holder.

- (d) Calculate the volume of concrete required to make the candle holder.**

Give your answer in cm^3 to the nearest whole cm^3 .

(4 marks)

Answer _____ cm^3

(Total for Question 2 = 9 marks)

Turn over

3 Look at Figure 5 for Question 3 in the Diagram Booklet. It shows a vegetable growing frame that is manufactured from a softwood.

**(a) Name ONE softwood that can be used to manufacture the vegetable growing frame.
(1 mark)**

**(b) Explain ONE reason for manufacturing the vegetable growing frame from a softwood rather than a hardwood.
(2 marks)**

(continued on the next page)

Turn over

3 continued.

The original length of timber that is used to make the frame is 300 cm.

The combined length of one short side and one long side of the frame is 270 cm.

- (c) Calculate how much timber is left when a short side and a long side have been cut to size, giving your answer as a fraction of the original length of timber.**

**Ignore the width of any saw cuts.
(2 marks)**

Answer _____

(continued on the next page)

Turn over

3 continued.

Look at Figure 6 for Question 3(d) in the Diagram Booklet. It shows a mild steel fixing that has been used to join the vegetable growing frame together at the corners.

**(d) Explain ONE disadvantage of using mild steel for the fixing.
(2 marks)**

(continued on the next page)

Turn over

3 continued.

The vegetable growing frame is delivered in a box manufactured from corrugated board.

- (e) Explain TWO benefits of using corrugated board to manufacture the box.
(4 marks)**

Answer space continues on the next page.

1 _____

Turn over

3(e) continued.

2 _____

(Total for Question 3 = 11 marks)

4 Look at Figure 7 for Question 4 in the Diagram Booklet. It shows a polyester laptop bag.

**(a) Explain ONE working property of polyester that makes it an appropriate choice of material to make the laptop bag.
(2 marks)**

(continued on the next page)

Turn over

4 continued.

(b) The material for the laptop bag is 60% new polyester and the rest is recycled polyester.

The laptop bag requires 320 grams of polyester in total.

**Calculate how many grams of recycled polyester are required for the laptop bag.
(2 marks)**

Answer _____ grams

(continued on the next page)

Turn over

4 continued.

The manufacturer carries out a life cycle analysis (LCA) to help reduce the environmental impact of the laptop bag.

**(c) Explain ONE outcome of an LCA that can help to reduce the environmental impact of the laptop bag.
(2 marks)**

(continued on the next page)

Turn over

4 continued.

- (d) Discuss how the features of modern laptops have contributed to remote working.
(6 marks)**

Answer space continues on the next 4 pages.

Turn over

4(d) continued.

Turn over

4(d) continued.

Turn over

4(d) continued.

Turn over

4(d) continued.

[illegible]

(Total for Question 4 = 12 marks)

TOTAL FOR SECTION A = 40 MARKS

Turn over

SECTION B**POLYMERS**

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

- 5 Look at Figure 8 for Question 5(a) in the Diagram Booklet. It shows a design solution for a display stand to hold three boxes of chocolates together with some additional information.**

(continued on the next page)

5 continued.

(a) The display stand holds three boxes of chocolates and needs to be improved to include the following specification points.

The display stand must:

- be able to hold an additional three boxes of chocolates and allow the top face of each individual chocolate box to be seen**
- include a method to show the price of a box of chocolates that allows the price to be changed**
- be portable so that it can be moved to another place without the chocolate boxes falling off.**

(continued on the next page)

5(a) continued.

Use notes and sketches to show how the display stand could be modified to include these three specification points.

You will be marked on how you apply your understanding of design and technology, not your graphical skills.

**Use the outline of the original design solution to show your modifications.
(6 marks)**

(continued on the next page)

5 continued.

(b) Look at Figure 9 for Question 5(b) in the Diagram Booklet. It shows a polymer puzzle that is used to help develop hand–eye coordination in young children.

Explain TWO ways that the polymer puzzle meets, or fails to meet, the criterion of providing a method to help develop hand–eye coordination in young children.

(4 marks)

Answer space continues on the next page.

1 _____

Turn over

5(b) continued.

2 _____

(Total for Question 5 = 10 marks)

- 6 Look at Figure 10 for Question 6(a) in the Diagram Booklet. It shows a child's play fishing set. The set is sold with written instructions explaining how to use it.**

The fishing rod handle is manufactured from high impact polystyrene (HIPS).

- (a) Explain TWO characteristics of HIPS that make it an ideal material from which to make the fishing rod handle.
(4 marks)**

Answer space continues on the next page.

1 _____

6(a) continued.

2 _____

(continued on the next page)

6 continued.

(b) Look at Figure 11 for Question 6(b) in the Diagram Booklet. It shows the outline of a fish marked out on a piece of 6 mm acrylic.

Use notes and sketches, on the blank page for Question 6(b) in the Diagram Booklet, to show how the fish would be cut out using hand tools.

**You will be marked on how you apply your understanding of design and technology, not your graphical skills.
(4 marks)**

(continued on the next page)

6 continued.

(c) Explain ONE way that the manufacturer can avoid causing offence to potential buyers of the play fishing set in different countries. (2 marks)

(continued on the next page)

Turn over

6 continued.

(d) Give TWO different methods that could be used to manufacture the cylindrical HIPS fishing rod handle from a length of square section material.

**Explain ONE reason for using each manufacturing method.
(6 marks)**

Answer space continues on the next page.

Method 1

Explanation

Turn over

6(d) continued.

Method 2

Explanation

(TOTAL FOR QUESTION 6 = 16 MARKS)

Turn over

- 7 Look at Figure 12 for Question 7(a) in the Diagram Booklet. It shows a polymer toy that is manufactured in a batch of 100 and a fastening that is used in the assembly of the toy.**

**(a) Name the specific type of fastening shown in Figure 12.
(1 mark)**

(continued on the next page)

7 continued.

Look at Figure 13 for Question 7(b) in the Diagram Booklet. It shows the rear wheel of the toy which has been made from 12 mm thick acrylonitrile-butadiene-styrene (ABS) using computer-aided manufacturing (CAM).

**(b) Explain TWO advantages of using CAM to manufacture the rear wheels of the toy.
(4 marks)**

Answer space continues on the next page.

1 _____

Turn over

7(b) continued.

2 _____

(continued on the next page)

7 continued.

(c) Look at Figure 14 for Question 7(c) in the Diagram Booklet. It shows a dimensioned drawing of a template for the front section of the toy.

The template will be used to mark out the front section of the toy and will be made from 5mm thick material.

**Produce an isometric drawing of the template on the grid provided on page 21 of the Diagram Booklet.
(5 marks)**

(continued on the next page)

7 continued.

- (d) Explain TWO disadvantages of using a template to mark out the front section of the toy.
(6 marks)**

Answer space continues on the next page.

1 _____

Turn over

7(d) continued.

2 _____

(TOTAL FOR QUESTION 7 = 16 MARKS)

Turn over

- 8 Look at Figure 15 for Question 8 in the Diagram Booklet. It shows some cutlery manufactured from polystyrene.**

Polystyrene is a lightweight material.

- (a) Explain ONE OTHER benefit of using polystyrene for the cutlery.
(2 marks)**

(continued on the next page)

8 continued.

- (b) Explain ONE cost factor that will have been considered when selecting polystyrene as the material from which to manufacture the cutlery.
(3 marks)**

(continued on the next page)

Turn over

8 continued.

- (c) Explain TWO quality control checks that would be carried out on the cutlery before it is allowed to leave the factory.
(4 marks)**

Answer space continues on the next page.

1 _____

Turn over

8(c) continued.

2 _____

(d) The cutlery is manufactured in China and sold around the world.

Look at Figure 16 for Question 8(d) in the Diagram Booklet. It shows some additional information about the cutlery.

Analyse the information in Figure 16.

(continued on the next page)

8(d) continued.

Evaluate the cutlery with reference to social factors including:

- **use for different social groups**
- **trends / fashion**
- **popularity.**
(9 marks)

Answer lines continue on the next 7 pages.

Turn over

8(d) continued.

Turn over

8(d) continued.

Turn over

8(d) continued.

Turn over

8(d) continued.

Turn over

8(d) continued.

Turn over

8(d) continued.

Turn over

8(d) continued.

(Total for Question 8 = 18 marks)

TOTAL FOR SECTION B = 60 MARKS
TOTAL FOR PAPER = 100 MARKS
END OF PAPER