AQA

Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

A-level

DESIGN AND TECHNOLOGY: PRODUCT DESIGN

Paper 1 Technical Principles

7552/1

Wednesday 5 June 2024 Afternoon

Time allowed: 2 hours 30 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]

JUN247552101

BLANK PAGE

MATERIALS

For this paper you must have:

- **normal writing and drawing instruments**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen. Use pencil only for drawing.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**

INFORMATION

- **The marks for questions are shown in brackets.**
- **The maximum mark for this paper is 120.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

BLANK PAGE

Answer ALL questions in the spaces provided.

0 1

Give THREE reasons why cellulose acetate is used in packaging. [3 marks]

Reason 1 _____

_____

Reason 2 _____

_____

Reason 3 _____

_____

3

[Turn over]

0 2

Analyse and evaluate the suitability of using acrylonitrile butadiene styrene (ABS) for the manufacture of a construction worker's helmet shown in FIGURE 1.
[6 marks]

FIGURE 1

6

[Turn over]

0 3

Identify the polymer stock form used for the following manufacturing processes. [3 marks]

Injection Moulding _____

_____

Vacuum Forming _____

_____

Rotational Moulding _____

_____

3

0 4

Explain why thermochromatic pigment has been used in the child's forehead thermometer shown in FIGURE 2. [6 marks]

FIGURE 2

_____

_____

_____

6

[Turn over]

0 5 . 1

A sheet of plywood today costs £85. It has increased in price by 38% over the past year.

Calculate the original price of the plywood sheet.

Show your working. [3 marks]

Answer £ _____

0 5 . 2

I have a budget of £850 which allows me to buy 10 sheets of plywood.

Calculate how many sheets I would have been able to buy last year with £850.

Show your working. [2 marks]

Answer _____ sheets

5

0 6

Describe the process used to create the laser-cut plywood coaster shown in FIGURE 3. [6 marks]

FIGURE 3

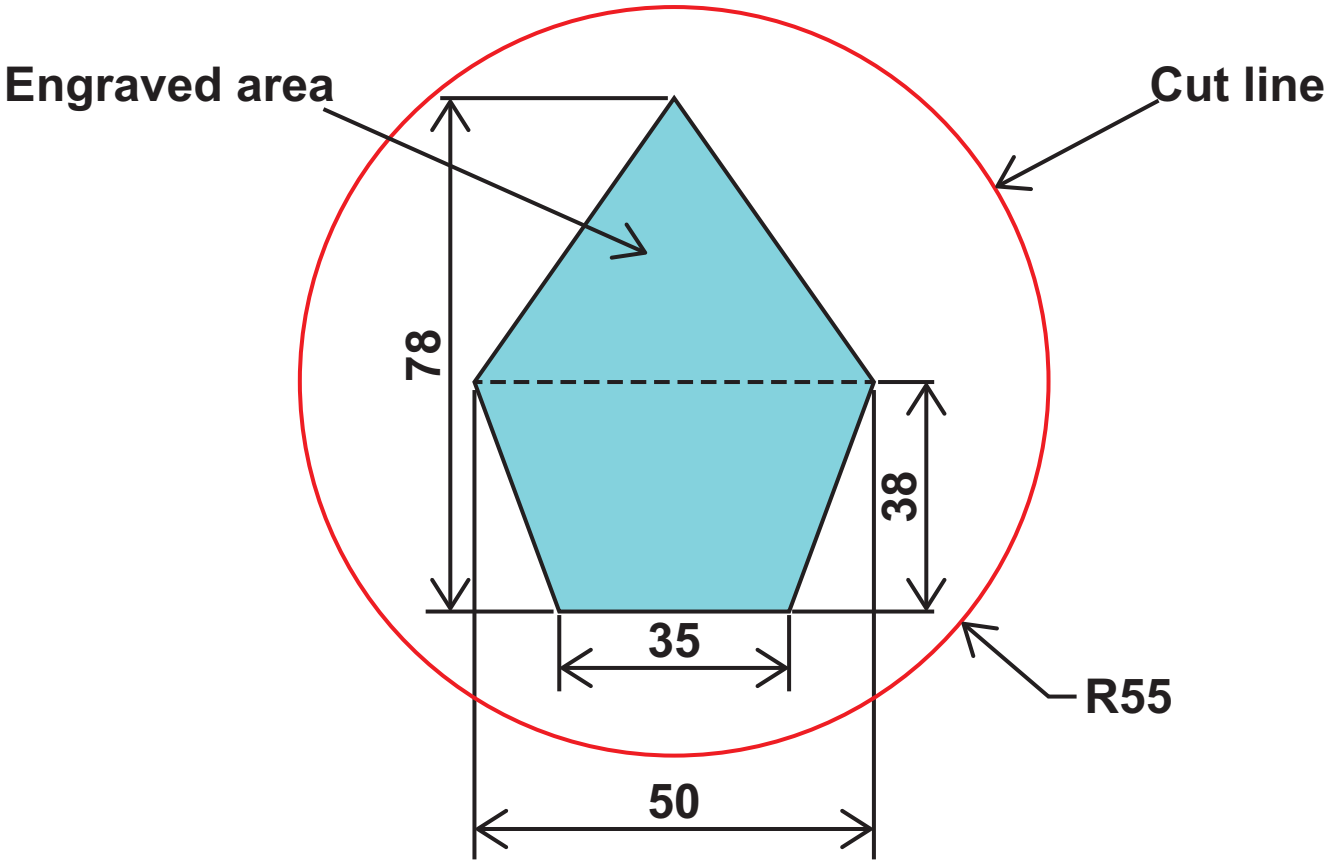
6

[Turn over]

0 7

FIGURE 4 shows a representation of a laser-engraved coaster.

FIGURE 4



Not drawn to scale
All dimensions in mm

LASER CUTTER SETTINGS	
Cutting speed	8 mm per second
Engraving speed	59 mm^2 per second

0 7 . 1

Calculate the total area of the shaded part of the coaster.

Show your working. [3 marks]

Answer _____ **mm^2**

[Turn over]

0 7 . 2

Calculate the total time taken to engrave the shaded part of the coaster and to cut the circumference.

Show your working. [4 marks]

Answer _____ seconds **7**

BLANK PAGE

[Turn over]

0 8

Describe why pewter is often used for casting in a school workshop. [6 marks]

6

[Turn over]

0 9

Explain why Plastazote foam is an appropriate material for the manufacture of the exercise mat shown in FIGURE 5. [6 marks]

FIGURE 5

6

[Turn over]

1 0

Compare the following joining methods for attaching two thin sheets of aluminium:

- **pop rivets**
- **nuts and bolts.**

[6 marks]

6

[Turn over]

1 1

Explain the benefits of a manufacturing simulation when making a component on a Computer Numerically Controlled (CNC) router. [6 marks]

6

[Turn over]

1 2

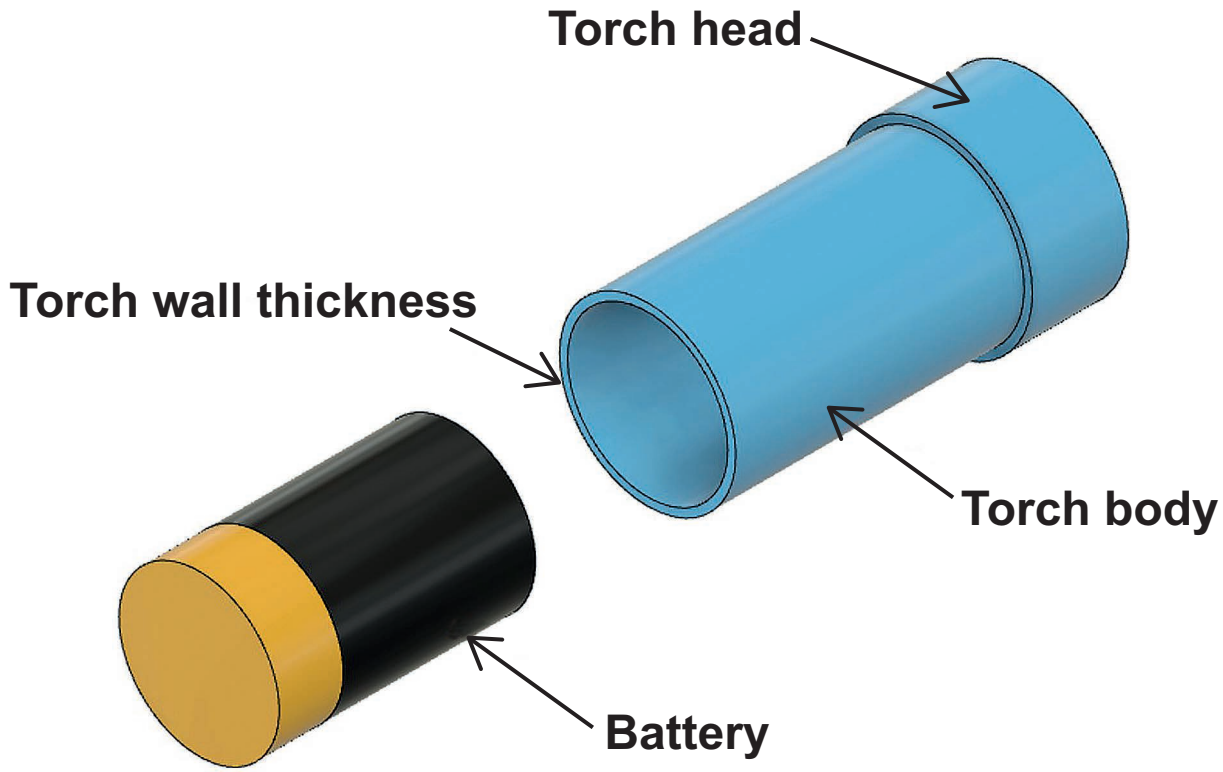
FIGURE 6 shows a torch body and battery.

The volume of the battery is 30 772 mm^3

The length of the battery is 50 mm

The wall thickness of the torch body is 3 mm

FIGURE 6



Not drawn to scale

Calculate the external diameter of the torch body, assuming that the battery fits exactly. [4 marks]

Answer _____ mm

4

[Turn over]

1 3

FIGURE 7 and FIGURE 8 show dishwashing accessories.

FIGURE 7

FIGURE 8

	FIGURE 7	FIGURE 8
Method of manufacture	Injection moulded	Blow moulded
Handle texture	Over moulded with a Thermoplastic Elastomer (TPE)	Integrated during the moulding process

Analyse and evaluate the method of manufacture used to create each of the textured surfaces on the two handles. [6 marks]

6

1 4

Describe the techniques a company may use throughout design and manufacture to reduce material waste.
[6 marks]

6

[Turn over]

1 5

FIGURE 9 shows a pie chart that gives information about consumer activities relating to sustainability.

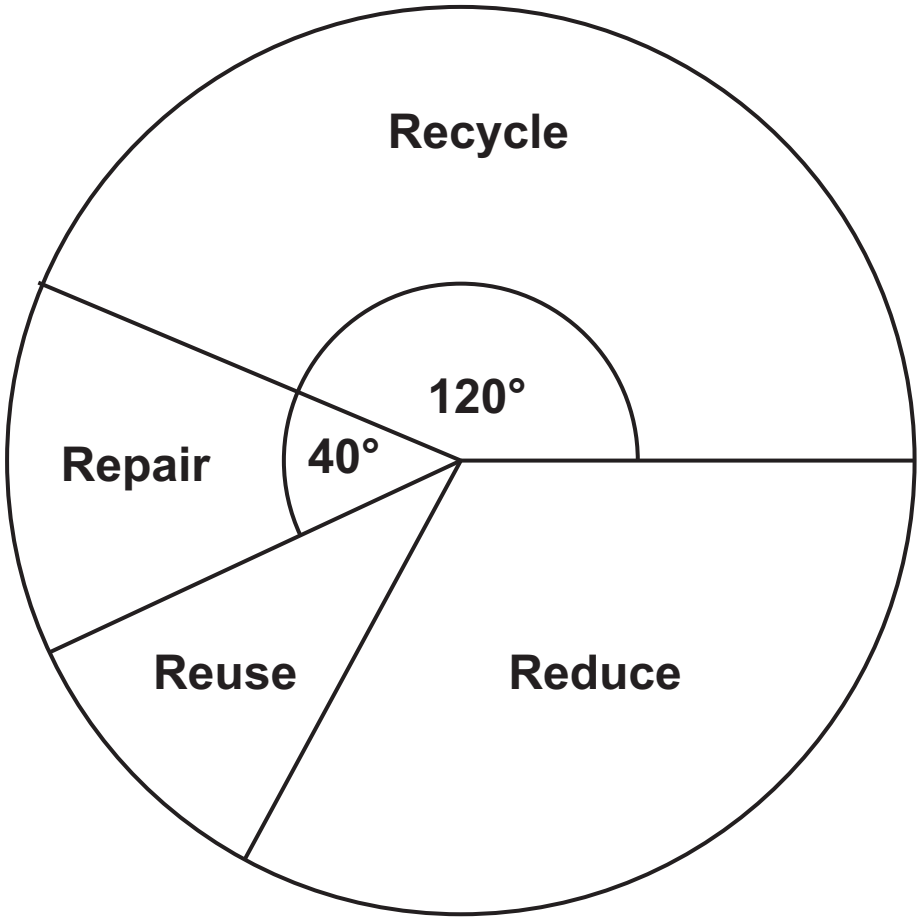
The number of people who said that they REUSE a product is 350.

Three times as many people said that they have REDUCED their consumption compared with the number of people that REUSE a product.

Calculate the number of consumers that RECYCLE on a regular basis.

Show your working. [4 marks]

FIGURE 9



Not drawn to scale

Answer _____ consumers

4

[Turn over]

1 6

State FOUR measures that an employer may consider to ensure that they are meeting the Health and Safety at Work Act 1974. [4 marks]

1 _____

_____

_____

_____

_____

2 _____

_____

_____

_____

_____

_____

3 _____

_____

_____

_____

_____

_____

4 _____

_____

_____

_____

_____

4

[Turn over]

1 7

FIGURE 10 and FIGURE 11 show cookbook stands.

FIGURE 10

FIGURE 11

	FIGURE 10	FIGURE 11
Material	Cast Iron	Medium Density Fibreboard (MDF) and Beech
Method of manufacture	Sand Casting	CNC router and hand fabrication

Analyse and evaluate the two cookbook stands.

In your answer you should refer to:

- **the materials used**
- **the manufacturing methods used.**

[12 marks]

12

[Turn over]

1 8

Discuss the implications to a company of rebranding.
[9 marks]

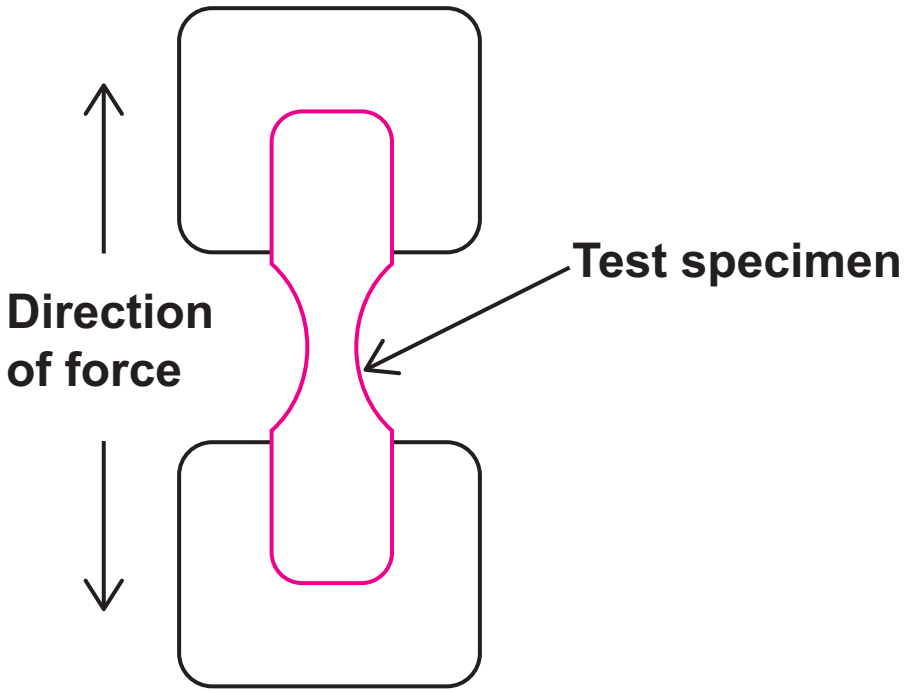
9

1 9 . 1

FIGURE 12 below and FIGURES 13 and 14 on pages 44 and 45, show graphical representations of material testing processes.

For each testing process, identify the material property being tested.

FIGURE 12



Material property being tested

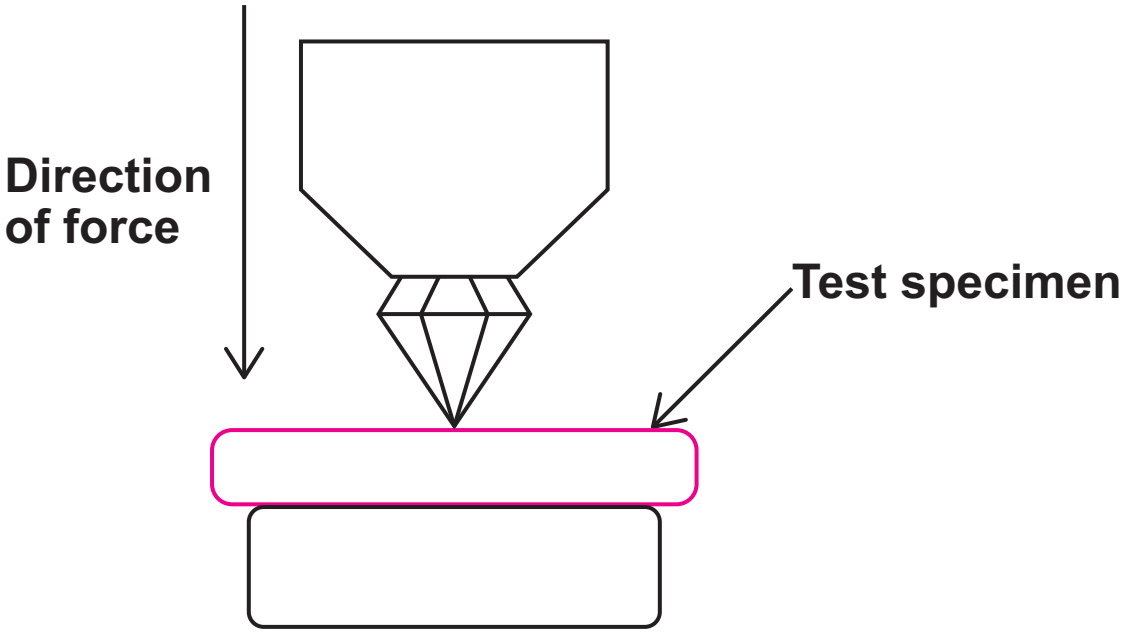
_____

[1 mark]

[Turn over]

1 9 . 2

FIGURE 13



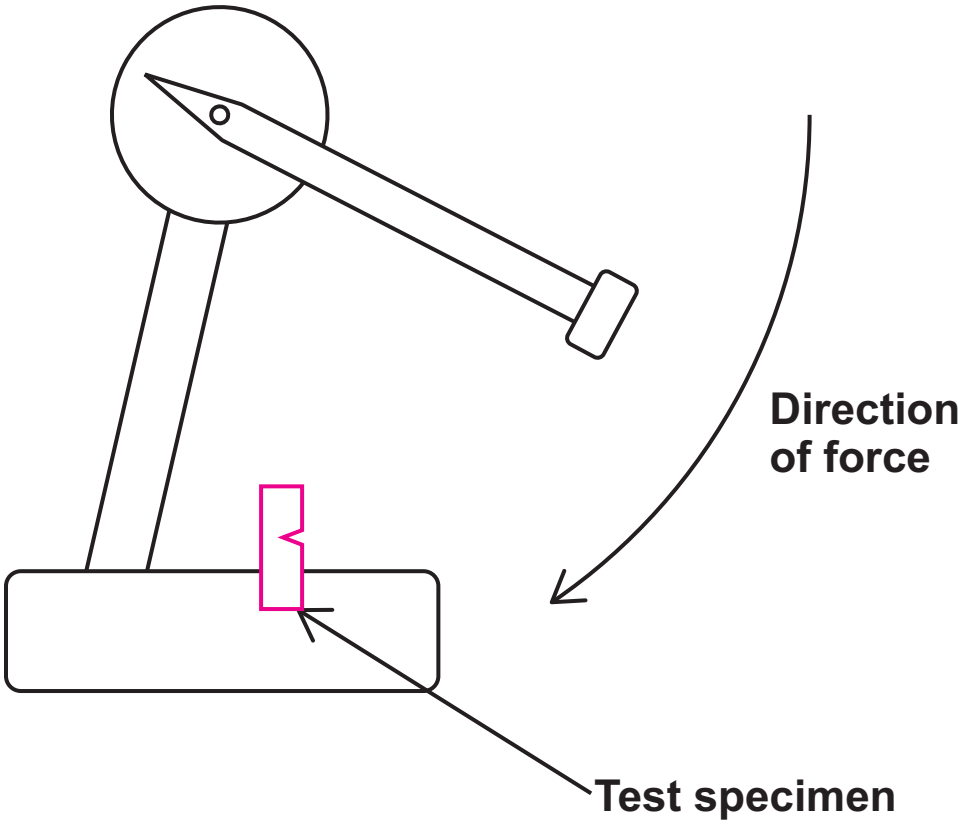
Material property being tested

_____

[1 mark]

19.3

FIGURE 14



Material property being tested

_____ 3

[1 mark]

[Turn over]

2 0

Explain why the screen printing process is suitable for a low volume production run. [6 marks]

6

2 1

Explain the factors that should be considered before forming a curved piece of timber by steam bending.
[6 marks]

6

END OF QUESTIONS

Additional page, if required.
Write the question numbers in the left-hand margin.

Additional page, if required.
Write the question numbers in the left-hand margin.

Additional page, if required.
Write the question numbers in the left-hand margin.

Additional page, if required.
Write the question numbers in the left-hand margin.

BLANK PAGE

BLANK PAGE

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
TOTAL	