



**Please write clearly, in block capitals**

**Centre number** \_\_\_\_\_

**Candidate number** \_\_\_\_\_

**Surname** \_\_\_\_\_

**Forenames(s)** \_\_\_\_\_

**Candidate's signature** \_\_\_\_\_

# **GCSE Design and Technology**

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**Date of Exam** \_\_\_\_\_

**Time allowed: 2 hours**

## **Materials**

For this paper you must have:

- normal writing and drawing instruments
- a calculator
- a protractor

## **Instructions**

- Use black ink or black ball-point pen. Use pencil only for drawing
- Fill in the information at the top of this page
- Answer all questions
- You must answer the questions in the spaces provided. Do not write on blank pages
- Do all rough work in this paper. Cross through any work that you do not want to be marked

## **Information**

- The marks for questions are shown in brackets
- The maximum mark for this paper is 100



- There are 20 marks for Section A, 30 marks for Section B and 50 marks for Section C

## **SECTION A - Core Technical Principles**

Questions 1-10 are multiple choice questions. For multiple choice questions you should shade in one lozenge. If you make a mistake, cross through the incorrect answer and shade the correct response.

- 1: A designer has created a road safety system for children. It alerts other road users of their presence through a visual stimulus. What is the output in this system? [1 mark]

- ◇ Beeping sound
- ◇ Flashing lights
- ◇ Vibrating alert
- ◇ Waterproof audio device

- 2: **Figure 1** shows a pair of scissors.



**Figure 1**

Which class of lever is the pair of scissors?

[1 mark]

- ◇ Class 1 lever
- ◇ Class 2 lever
- ◇ Class 3 lever
- ◇ Class 4 lever

- 3: Which **one** of the following best describes a materials ability to be shaped or flattened into a thin sheet without cracking, tearing or snapping?

[1 mark]

- ◇ Brittleness
- ◇ Hardness
- ◇ Malleability



- ◇ Toughness
- 4: Which **one** of the following is the stimulus needed for thermochromic pigment to change colour? [1 mark]
- ◇ Electricity
  - ◇ Heat
  - ◇ Pressure
  - ◇ Ultraviolet light
- 5: Which **one** of the following statements is true? [1 mark]
- ◇ Balsa is from a softwood tree
  - ◇ Corrugated card is used as protective packaging
  - ◇ Silk is a synthetic fibre
  - ◇ Zinc is an alloy
- 6: Which **one** of the following fibres can be made into an entirely natural textile? [1 mark]
- ◇ Elastane
  - ◇ Polyamide
  - ◇ Polyester
  - ◇ Wool
- 7: Which **one** of the following is an alloy? [1 mark]
- ◇ Aluminium
  - ◇ Brass
  - ◇ Copper
  - ◇ Zinc
- 8: Which **one** of the following statements is **false**? [1 mark]
- ◇ A buzzer is an output component
  - ◇ A light emitting diode is an input component
  - ◇ A microcontroller is a process component
  - ◇ A speaker emits sound



9: Which sentence best describes a technical textile? [1 mark]

- ◇ A fabric that allows water to pass through it easily
- ◇ A very tough and heavyweight fabric
- ◇ Fibres are spun, blended and/or layered to make enhanced fabrics
- ◇ A very quick drying fabric

10: What is duplex board commonly used for? [1 mark]

- ◇ Packaging boxes
- ◇ High-quality watercolour paintings
- ◇ Takeaway container lids
- ◇ Tracing a design

11: State **two** properties that make technical fibres such as Kevlar, suitable for use in clothing for the emergency services. [2 marks]

Property 1. \_\_\_\_\_  
\_\_\_\_\_

Property 2. \_\_\_\_\_  
\_\_\_\_\_

12: State **two** reasons why chipboard is commonly used for flooring. [2 marks]

1. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



13.1: Composite materials are used when two or more different materials are combined to create a new material with improved properties and functionality.

- a) Name **one** composite material. [1 mark]

- b) For your chosen composite material, name **two** of the materials that have been combined? [2 marks]

Material 1: \_\_\_\_\_

Material 2: \_\_\_\_\_

13.2: Many composite materials are not considered to be environmentally friendly at the end of life.

- Give **one** reason why this is the case. [1 mark]

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13.3: A designer has chosen to use a composite material for the construction of a child's toy instead of the usual material.

The usual material costs £2.60 per square metre.

The composite material costs 25% more.

- a) How much does 1 square metre of the composite material cost? [1 mark]

- b) The client wants to produce 150 toys. Three toys can be made from 1 square metre of the composite material.

How much is the total cost of the composite material for all 150 toys? [1 mark]

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## SECTION B - Specialist Technical Principles

### Specialist processing

Laminating	Embossing	Extrusion	Laser cutting	Pleating	Anodising
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Specialist processing techniques include:

14.1: Choose **one** specialist processing technique from the list below.

Name of chosen specialist process \_\_\_\_\_

Give **two** reasons why the named process is used. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

14.2: In the box below, use notes and sketches to explain how your chosen process from **14.1** is performed using an appropriate material of your choice. [4 marks]



15: Give **two** different reasons why a surface finish is applied to a material or product.

Give examples in your answer.

1.

[2 marks]

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2.

[2 marks]

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16.1: Choose **one** product in **Figure 2** and describe **two** features that make it suitable for one-off production.

		
Tailored suit	Wedding ring	Fibreglass sculpture
		
Wooden bureau	Architectural model	Personalised wheelchair

**Figure 2**

Name of chosen product \_\_\_\_\_

Feature 1: [2 marks]

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Feature 2:

[2 marks]

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16.2: Choose **one** process that requires an element of hand tool skills or finishing. This could be one of the processes used on your chosen product in **16.1**.

Name of chosen specialist process \_\_\_\_\_

In the box below, use notes and sketches to explain the process in detail.

[4 marks]



17: Circle **one** of the following and give **two** reasons why its physical properties are suitable for the intended use.

- **Acrylic** – for a moulded bath
- **Carton board** – for a point of sales display stand
- **Cast iron** – for a metalwork vice
- **Ash** – for a baseball bat
- **Elastane** – for a pair of cycle shorts
- **Microcontroller** – for use in an electronic snooker scoreboard

1. [2 marks]

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2. [2 marks]

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This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

## **SECTION C – Designing and Making Principles**

**Figure 3** shows a hearing aid worn by an adult to assist with loss of hearing.



**Figure 3**

### **Specification**

- Very lightweight
- Comfortable to wear
- Low power consumption
- Easy to replace the batteries
- Adjustable volume control and an on/off switch

Evaluate the hearing aid in terms of the following points.

19.1: Suitability for the user

[4 marks]

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19.2: Aesthetic qualities

[4 marks]

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19.3: Ergonomics

[4 marks]

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20.1: Explain what is meant by the term ‘tolerance’ in relation to quality checking and how designers and manufacturers use it to ensure repetitive accuracy.

[4 marks]

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20.2: Describe **two** quality checks that might be carried out on the hearing aid pictured, that would involve checking a tolerance and explain why each would be used.



Check 1:

[2 marks]

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Check 2:

[2 marks]

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21.1: The data in the table, **figure 4**, shows the views of 120 business professionals who are hearing aid users. They were asked to rank the features in the table to find out which were the most important to them.

The table shows how many users ranked each point as the most important.

Complete the table by calculating the **two** missing Number of users for 1 mark and **two** percentages for 1 mark.

[2 marks]

Most important feature	Number of users	Percentage of total
Ultra-small size		
Very long battery life	6	5%
Cost under £700 each	6	
Rechargeable batteries		10%
Almost invisible to sense when worn	66	55%
Total	120	100%

**Figure 4**

*Use this space for your working out:*

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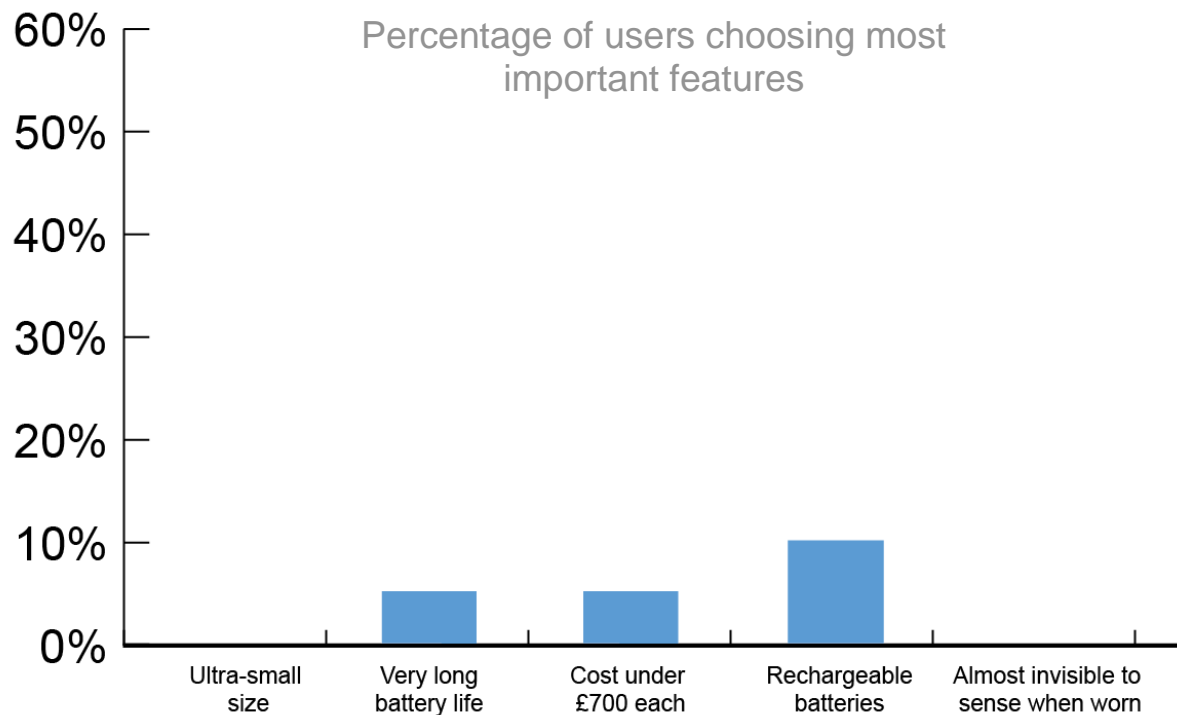
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21.2: Using the information in table **figure 4**, complete the bar chart below.

[2 marks]



21.3: Explain how this data may influence the design of a newer version of the hearing aid.

[3 marks]

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22.1: Market research is used by designers to find out important information that may influence the design of a product.

Name **two** different ways that designers could gather information that would help them decide how to design a product. The information could come from primary and/or secondary sources. In your answer explain how each source might influence a design.

1. [2 marks]

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2. [2 marks]

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22.2: Explain why designers ask potential customers to use and review prototypes of their products before finalising their designs. [3 marks]

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23.1: Designers often draw their designs in computer aided design (CAD) software packages.

Give **two** reasons why designers might render a CAD model of their proposed product with different finishes and/or different textures or materials. [2 marks]

1.

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2.

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23.2: Give **two** reasons why designers might choose a quick process to create models or early prototypes of a design, such as breadboarding a PCB, making a toile garment or making a card or Styrofoam model [2 marks]

1.

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2.

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25.1: A teacher is getting students to make origami animals in a lesson. The origami animals require one square piece of paper with a size of 200mm x 200mm.

A4 paper can be cut to size and costs £4.00 for a ream of 500 sheets. Special origami paper of the correct size costs £2.60 for 200 sheets.

Which is the most expensive paper to use?

Show your working out in your answer.

[2 marks]

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25.2: The teacher only has A4 paper which is 210mm x 297mm. The teacher gets the students to cut the A4 paper down to the correct size of 200mm x 200mm.

Work out how much waste is produced for each origami animal?

Show your working out, the answer and the units.

[3 marks]

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- 25.3: The teacher has decided to display the best of the finished origami animals in a display case along with a name card.

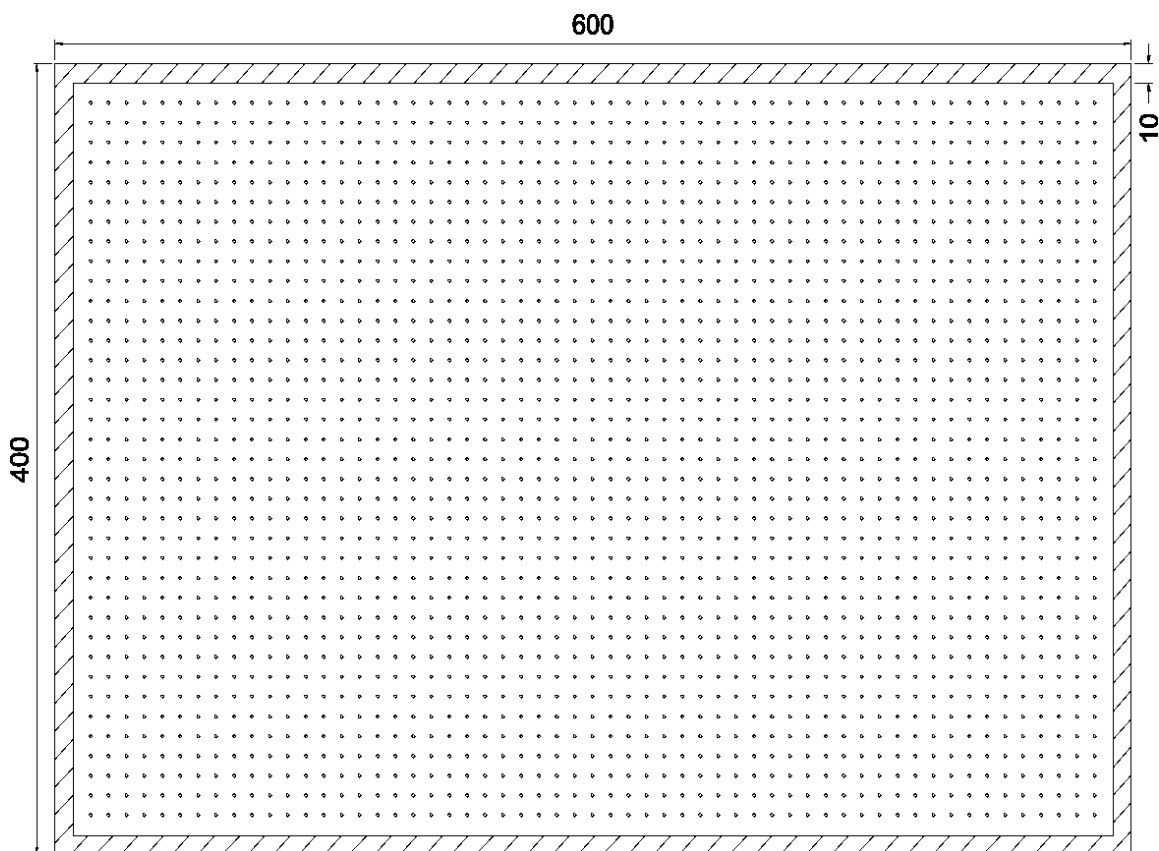
[1 mark]



To make sure the display case doesn't look overcrowded the teacher has decided that each student will need 125mm x 125mm of space in the display case.

Using the 2D plan of the display case below, work out how many students will be able to display their work. Note that there are 10mm thick clear acrylic sides to the display case.

Answer: \_\_\_\_\_



**END OF QUESTIONS**