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I declare this is my own work.

# GCSE DESIGN AND TECHNOLOGY

## Unit 1 Written Paper

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 boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or 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 100.
- There are 20 marks for Section A, 30 marks for Section B and 50 marks for Section C.

| For Examiner's Use |      |
|--------------------|------|
| Section            | Mark |
| A                  |      |
| B                  |      |
| C                  |      |
| <b>TOTAL</b>       |      |



J U N 2 2 8 5 5 2 W 0 1

IB/G/Jun22/E8

**8552/W**

**Section A – Core technical principles**Answer **all** questions in this section.Each of Questions **01** to **10** is followed by four responses, **A**, **B**, **C** and **D**.

For each question completely fill in the circle alongside the appropriate answer.

CORRECT METHOD



WRONG METHODS



If you want to change your answer you must cross out your original answer as shown.



If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown.

**0 1** Conductive textiles could be used to**A** burn at high temperatures.☐**B** change colour.☐**C** illuminate Light Emitting Diodes.☐**D** resist bullets.☐**[1 mark]****0 2** Micro encapsulation is used to make fabric**A** anti-bacterial.☐**B** conductive.☐**C** fire proof.☐**D** stronger.☐**[1 mark]**

**0 3**

A malleable material is one that

**A** can be pressed into a shape or form. ☐**B** is able to withstand scratches and indents. ☐**C** is hard to break or snap. ☐**D** rusts with exposure to air and moisture. ☐**[1 mark]****0 4**

When using marker pens, students find the ink stains other pages.

Which term should be looked for when selecting the paper to avoid this?

**A** Bleed proof ☐**B** Cartridge ☐**C** Layout ☐**D** Tracing ☐**[1 mark]****0 5**Which component is the **output** in a temperature warning system?**A** Lamp ☐**B** Microcontroller ☐**C** Switch ☐**D** Temperature sensor ☐**[1 mark]****Turn over for the next question****Turn over ►**

**0 6** Which **one** of the following is ferrous?

**A** Aluminium ☐

**B** Copper ☐

**C** Iron ☐

**D** Tin ☐

[1 mark]

**0 7** Identify the material shown in **Figure 1**.

**Figure 1**



**A** Balsa ☐

**B** Chipboard ☐

**C** Medium density fibreboard (MDF) ☐

**D** Plywood ☐

[1 mark]



**0 8** Which **one** of the following is a renewable resource?

- A Metal ore ☐
- B Natural gas ☐
- C Oil ☐
- D Water ☐

[1 mark]

**0 9** A tough material is described as one that can

- A bend and then return to its original shape. ☐
- B be pulled or stretched along its length. ☐
- C be shaped by pressing. ☐
- D withstand impacts without breaking. ☐

[1 mark]

**1 0** Which **one** of the following statements is **true**?

- A Continuous improvement is the concept of storing waste. ☐
- B Lean working reduces efficiency. ☐
- C Global warming is due to decreasing levels of carbon dioxide. ☐
- D Pollution is created by the burning of fossil fuels. ☐

[1 mark]

Turn over for the next question

Turn over ►



**1 1 . 1** Name **one** specific modern material.

**[1 mark]**

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**1 1 . 2** Explain why the use of modern materials improves the function of products.

**[2 marks]**

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|   |   |
|---|---|
| 1 | 2 |
|---|---|

High density polyethylene (HDPE) is widely used in the manufacture of household bottles and containers.



Give **two** detailed reasons why HDPE is suitable for this type of packaging.

**[2 x 2 marks]**

Reason 1 \_\_\_\_\_

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Reason 2 \_\_\_\_\_

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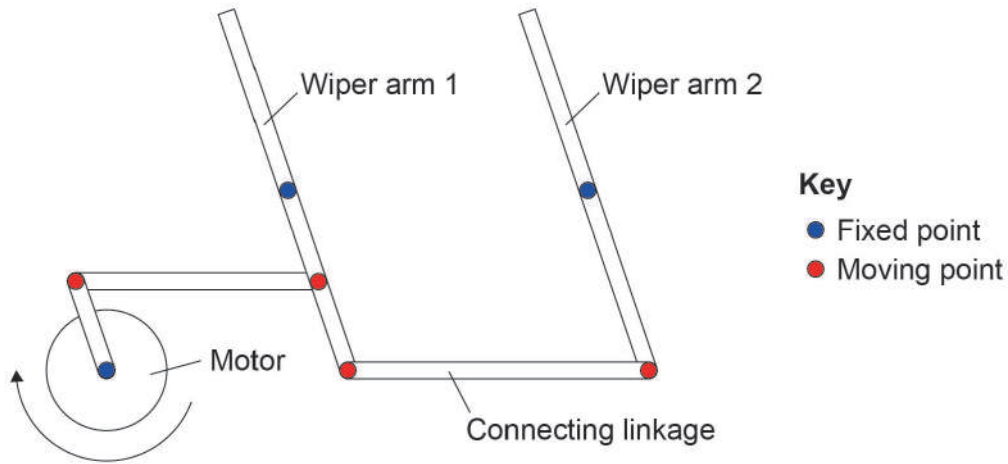
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**Turn over for the next question**

**Turn over ►**



1 3

Study the diagram of the mechanism for car windscreen wipers in **Figure 2**.**Figure 2**

1 3

1

State the type of motion in Wiper arm 1.

**[1 mark]**


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1 3

2

Explain the function of the connecting linkage.

**[2 marks]**


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**Section B – Specialist technical principles**Answer **all** questions in this section.**1 4****Table 1** identifies specific processes used to remove different materials and make sure materials are cut to a tolerance.Choose **one** process from **Table 1** and, using notes and/or sketches, describe the process in detail.**[5 marks]****Table 1**

|         |             |               |                     |
|---------|-------------|---------------|---------------------|
| Turning | Die cutting | Laser cutting | Cutting by shearing |
|---------|-------------|---------------|---------------------|

My chosen process is \_\_\_\_\_

**Turn over ►**

1 5 . 1

Describe what forces are acting on the bow and arrow in **Figure 3** before it is fired.**[3 marks]****Figure 3**


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1 5 . 2

Explain how materials can be improved by being reinforced. Give examples.

**[3 marks]**


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1 6 . 1

Explain the purpose of a template.

[2 marks]

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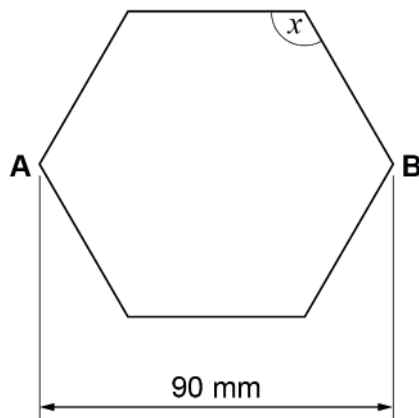


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1 6 . 2

A manufacturer needs to produce a hexagonal template like the one in **Figure 4**.The distance between points **A** and **B** needs to be 90 mm.**Figure 4**

Work out the length of one side of the hexagon.

[1 mark]

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1 6 . 3

Calculate the interior angle at  $x$  on the diagram.

[2 marks]

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Turn over ►



|   |   |
|---|---|
| 1 | 7 |
|---|---|

Explain how the **two** factors given below would be considered when selecting materials or components.

**[2 x 3 marks]**

Availability

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Cultural and social factors

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Carbon dioxide is released as a result of making, transporting and using a product during its lifetime. This is called a 'carbon footprint'.

Analyse and evaluate what factors contribute to carbon release or 'carbon footprint' from raw material source to final disposal.

Give examples in your answer.

**[8 marks]**

[illegible]

30

**Turn over for Section C**

**Turn over ►**



## Section C – Designing and making principles

Answer **all** questions in this section.

**1 9**

Study the pictures of garden furniture and packaging in **Figure 5** and **Figure 6** and the specifications in **Table 2**.

**Figure 5**



**Table, chairs and umbrella**

**Figure 6**



**Flat-pack furniture packaging**

**Table 2**

| Material specification for garden furniture in Figure 5 |                                                            |
|---------------------------------------------------------|------------------------------------------------------------|
| Material                                                | Description of use                                         |
| Timber                                                  | Table and chairs                                           |
| Fabric                                                  | Umbrella covering                                          |
| Metal                                                   | Fixtures and fittings to assemble                          |
| Polymers                                                | Umbrella stand base and end caps for chair legs            |
| Papers and boards                                       | Cardboard packaging and assembly instructions prior to use |



Analyse and evaluate the garden furniture and its packaging in terms of functionality. **[6 marks]**

[illegible]

**Turn over ►**



Analyse and evaluate how the design and manufacture of garden furniture may cause deforestation and what steps can be taken to address this.

[illegible]

**Turn over for the next question**

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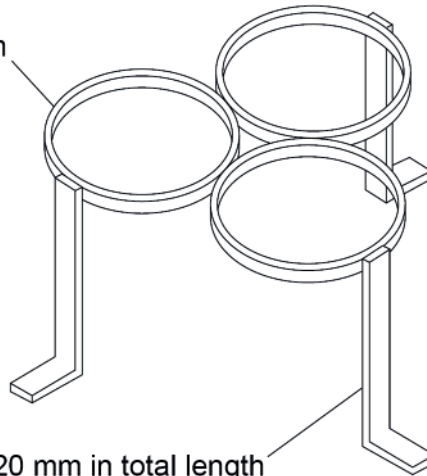


2 0

**Figure 7** shows a structure made from a number of material lengths cut and bent to shape.

**Figure 7**

Each hoop is of a diameter 90 mm



Each leg is 120 mm in total length

2 0

. 1

Calculate the length of material required to make **one** hoop to the nearest whole millimetre.

Show your working.

**[3 marks]**

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Answer \_\_\_\_\_ mm



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Calculate the total length of material required to make all the parts in **Figure 7** to the nearest whole centimetre.

Show your working.

**[4 marks]**

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Answer \_\_\_\_\_ cm

**Turn over for the next question**

**Turn over ►**



**2 1**

Materials frequently have to be deformed and reformed.

Choose **one** product from **Table 3**.**Table 3**

|                                                                                    |                                                                                     |                                                                                     |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|   |    |  |
| <b>Metal toy car</b>                                                               | <b>Birthday card</b>                                                                | <b>Polymer toothbrush</b>                                                           |
|  |  |                                                                                     |
| <b>Cotton skirt</b>                                                                | <b>Plywood chair</b>                                                                |                                                                                     |

My chosen product is \_\_\_\_\_



**2 1 . 1**

Name a specific deforming or reforming process used in the manufacture of your chosen product.

**[1 mark]**

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**2 1 . 2**

Explain why this process is used in the manufacture of your chosen product.

**[2 marks]**

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**2 1 . 3**

What safety issues need to be considered when using the specific process given in your answer to Question **21.1**?

**[2 marks]**

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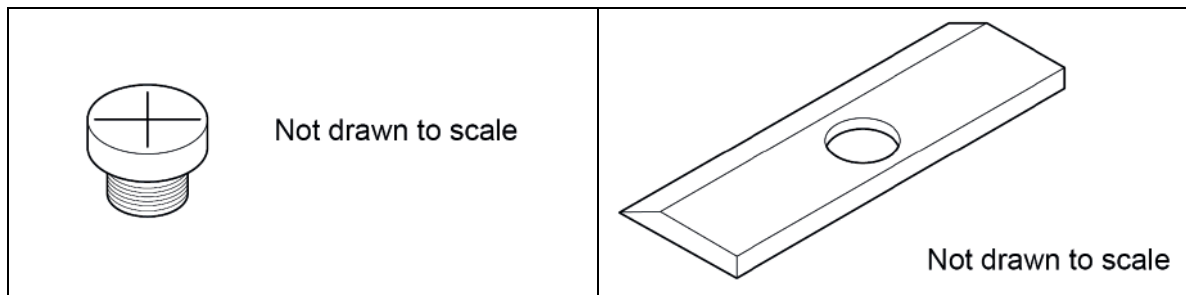
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**Turn over for the next question**

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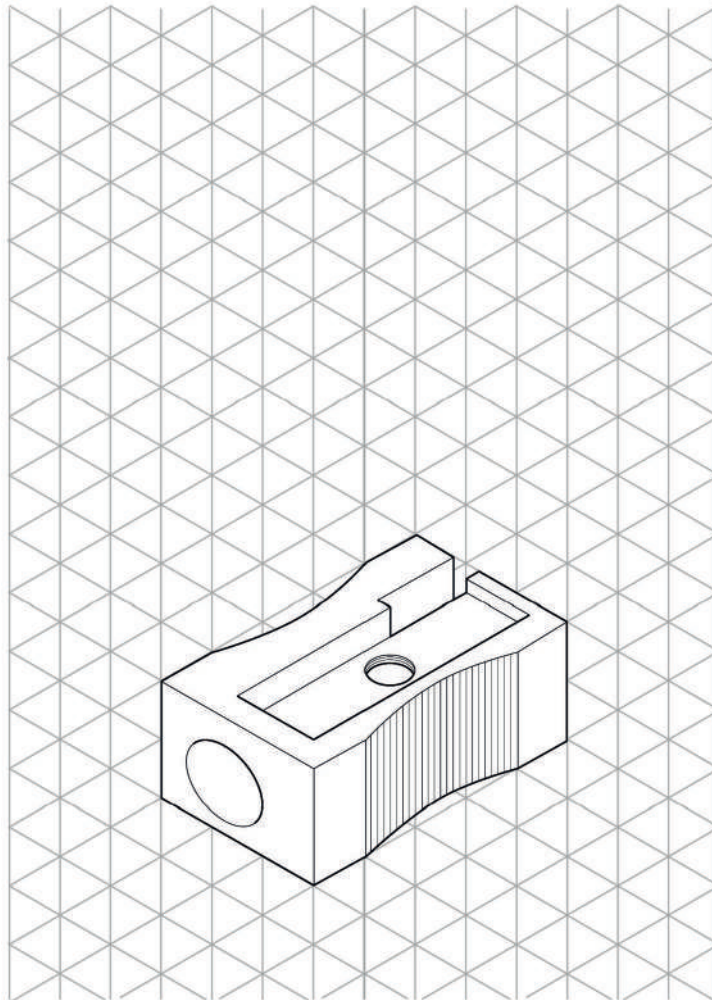
**2 2 . 1** Below are drawings of two parts needed to make a pencil sharpener.



Complete an exploded isometric drawing in **Figure 8** showing how the parts of the sharpener are assembled.

**[5 marks]**

**Figure 8**



2 2 . 2

Exploded drawings show details of an object in a unique way.

Explain where and why exploded drawings are used.

Give examples in your answer.

**[4 marks]**


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2 3

Sketching is used by designers to communicate information.

Describe **one** advantage and **one** disadvantage of freehand sketching over computer aided design (CAD) drawing.**[2 x 2 marks]**

Advantage \_\_\_\_\_

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Disadvantage \_\_\_\_\_

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**Turn over ►**

**2 4 . 1** Define the term 'datum point'.

[1 mark]

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**2 4 . 2** Explain why datum points are used during manufacturing.

[2 marks]

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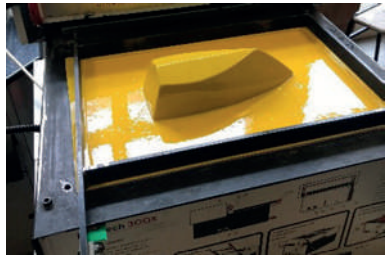
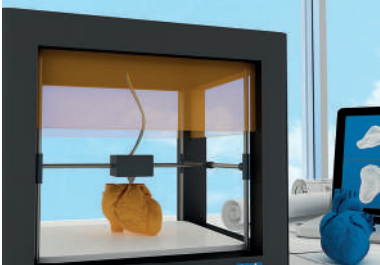
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**2 5** The images in **Table 4** are of specialist pieces of Design and Technology equipment.

**Table 4**

|                                                                                     |                                                                                      |                                                                                       |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|  |   |  |
| <b>Laser cutter</b>                                                                 | <b>Overlocker</b>                                                                    | <b>Vacuum former</b>                                                                  |
|  |  |                                                                                       |
| <b>3D printer</b>                                                                   | <b>Centre lathe</b>                                                                  |                                                                                       |



Choose **one** piece of specialist equipment from **Table 4**.

My chosen piece of equipment is \_\_\_\_\_

**2 5 . 1**

Describe how your chosen piece of equipment is used.

**[3 marks]**

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**2 5 . 2**

Explain the checks you would make to ensure the equipment is able to produce quality outcomes.

**[3 marks]**

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**Turn over for the next question**

**Turn over ►**



|   |   |
|---|---|
| 2 | 6 |
|---|---|

Explain the importance of evaluation when developing prototypes.

Give specific examples in your answer.

**[4 marks]**

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**END OF QUESTIONS**



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