

# INTERNATIONAL GCSE DESIGN AND TECHNOLOGY: PRODUCT DESIGN

Paper 1 Technical, designing and making principles

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Specimen paper

07:00 GMT

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.

## 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**

Identify the source of renewable energy.

[1 mark]

A Coal

B Hydro-electrical

C Natural gas

D Oil

**0 2**

What is the electrical component shown in **Figure 1** used for?

[1 mark]

**Figure 1**



A To detect pressure levels

B To detect temperature levels

C To switch equipment on or off

D To switch the direction of a motor

**0 3**

A ductile material is commonly described as one that

**[1 mark]**

**A** can be drawn into a long length.

**B** does not scratch easily.

**C** resists corrosion and oxidation.

**D** shatters under a sudden impact.

**0 4**

Aluminium is used in the manufacture of cooking pots because it has which property?

**[1 mark]**

**A** Absorbency

**B** Density

**C** Electrical conductivity

**D** Thermal conductivity

**0 5**

A designer has been asked to create load-bearing furniture from card or board.

Identify the most suitable material for this project.

**[1 mark]**

**A** Corrugated card

**B** Foil lined board

**C** Ink jet card

**D** Solid white board

**Turn over for the next question**

**0 6**

A smart material is one which

**[1 mark]**

- A** conducts electricity.
- B** protects against fire.
- C** reacts to a stimulus.
- D** waterproofs wood.

**0 7**Which **one** of the following is a manufactured board?**[1 mark]**

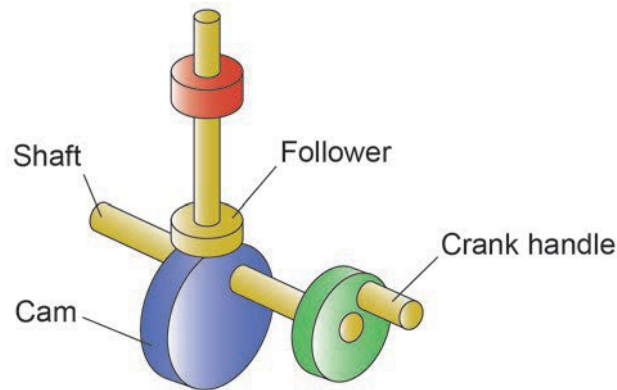
- A** Ash
- B** Balsa
- C** Plywood
- D** Spruce

0 8

What change in motion takes place in the mechanism in **Figure 2** when the crank handle is turned?

[1 mark]

Figure 2



- A Linear to reciprocating
- B Oscillating to rotary
- C Reciprocating to linear
- D Rotary to reciprocating

0 9

Which **one** of the following statements about industry is true?

[1 mark]

- A An increased use of robotics has led to a reduction in manual jobs.
- B An increased use of robotics means more people need to be employed.
- C The latest production lines require more people who can use hand tools skilfully.
- D The use of CAD and CAM in industry has led to less efficiency

1 0

Which **one** of the following is a feature of a product designed for maintenance?

[1 mark]

- A Biodegradable materials
- B Complex electronics
- C Planned obsolescence
- D Repairable components

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Name **one** alloy.**[1 mark]**

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1	1	.	2
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Explain why metals are alloyed.

**[2 marks]**

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1	2
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Composite materials such as foil and polymer lined boards are used in food and drink packaging.

**Figure 3**



Give **one** advantage and **one** disadvantage of using composite materials for packaging.

**[2 marks]**

Advantage \_\_\_\_\_

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Disadvantage \_\_\_\_\_

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**Turn over for the next question**

1 3

Toy trains like the one in **Figure 4** are to be painted.

**Figure 4**



Paint is purchased in tins that can each cover 4 square metres. **Table 1** shows the amount of paint in **each** colour required to paint one train.

**Table 1**

Colour	Paint needed m <sup>2</sup>
Blue	0.20
Green	0.45
Red	0.30
Yellow	0.25

1 3 . 1

A batch of 50 trains are to be painted. Calculate the **total** number of tins of **green** paint that need to be purchased.

**[2 marks]**

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Answer \_\_\_\_\_



**1 3 . 2** What percentage of **green** paint will go to waste?

Calculate your answer to two decimal places.

**[3 marks]**

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Answer \_\_\_\_\_ %

**20**

**Turn over for the next question**





### Section B – Specialist technical principles

Answer **all** questions in this section.

**1 4**

The products/components shown in **Table 2** are manufactured from different materials.

**Table 2**

	
<b>Metal can opener</b>	<b>Card shoe box</b>
	
<b>Polymer gears</b>	<b>Wooden toy</b>

Choose **one** product/component and complete **Table 3**

**[3 marks]**

My chosen product/component is \_\_\_\_\_

**Table 3**

<b>Specific main material</b>	<b>Stock form used in manufacture</b>	<b>Appropriate finishing technique</b>





1 7

Name one process used to remove waste material to make different parts of a prototype.

Describe the process you have chosen.

[3 marks]

Name of process \_\_\_\_\_

Description of chosen process \_\_\_\_\_

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1 8 . 1

Choose one of the material categories in **Table 5** below.

**Table 5**

Metal based materials	Paper and boards	Polymers	Timber based materials
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My chosen material category is \_\_\_\_\_

Give the source or origin of your chosen material category.

[1 mark]

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Name **one** process used to convert your chosen material category into a workable form.

[1 mark]

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1	9
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Name **one** specific commercial manufacturing process and describe what it is used for.

Name of process \_\_\_\_\_

Using notes and/or sketches describe the process you have named above.

[4 marks]

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Explain why each factor below would need to be considered by a manufacturer when obtaining materials or components.

[4 marks]

Bulk buying \_\_\_\_\_

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Ethical factors \_\_\_\_\_

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30
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**Turn over for the next question**




### Section C – Designing and making principles

Answer **all** questions in this section.

2 1

Table 6 shows **three** different kettles.

Table 6

		
Cast iron stove kettle	Polymer electric kettle	Whistling kettle

Analyse and evaluate the kettles in terms of the **three** features identified below.

You should not use an analysis or evaluation point more than **once**.

2 1 . 1 Ergonomics

[4 marks]

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Give **five** detailed specification points to help with the designing of a toy for use by a child between 3 and 5 years of age.

**[5 marks]**

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**2 3**

Information is communicated in different ways by two (2D) and three dimensional (3D) drawings.

Describe **two** advantages 3D drawing has compared with 2D drawing.

**[4 marks]**

Advantage 1 \_\_\_\_\_

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Advantage 2 \_\_\_\_\_

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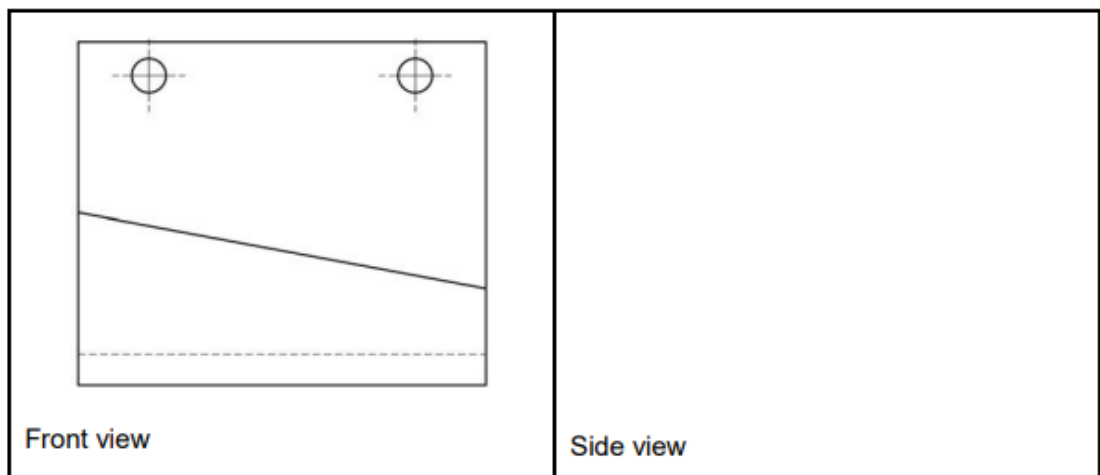
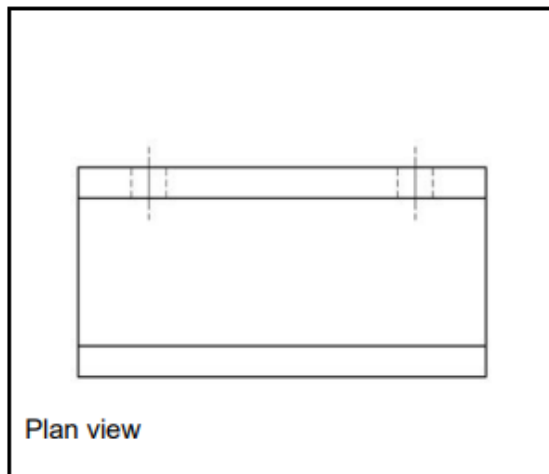
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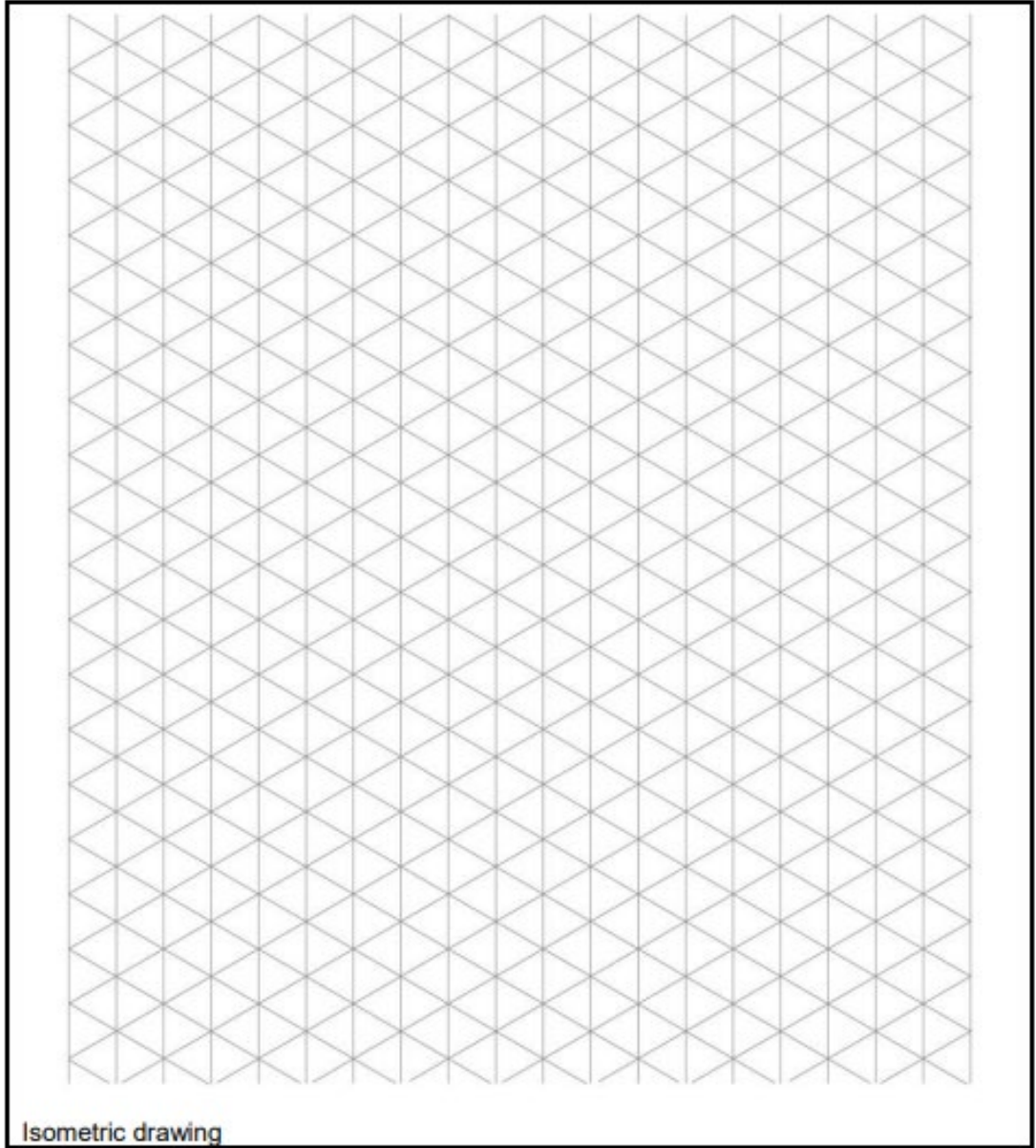
**Turn over for the next question**

**2 4**

Below is a drawing of a storage rack for letters.

Complete the third angle orthographic projection by adding a side view and isometric drawing of the shape in the boxes provided.

**[8 marks]**

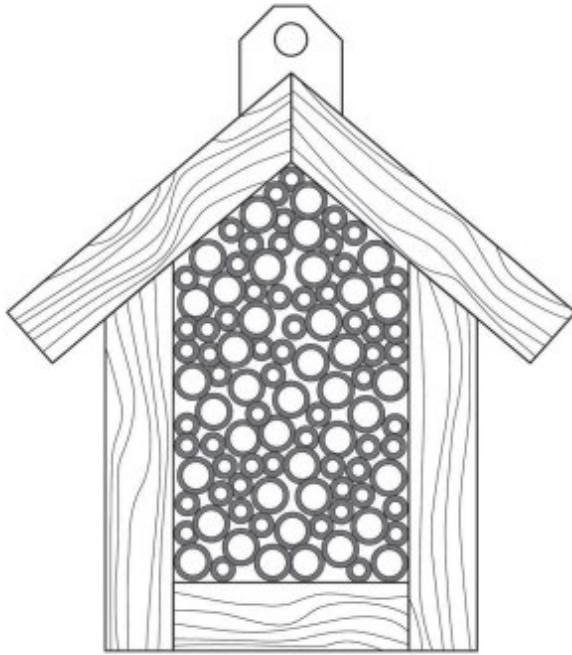


**Turn over for the next question**

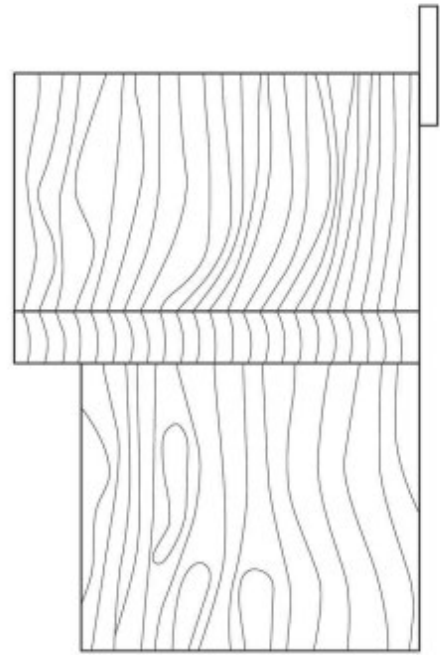
2	5
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**Figures 5 and 6** show a front and side view of a bug box used to encourage insects to visit an outdoor space, to encourage wildlife to fertilise plants.

**Figure 5**



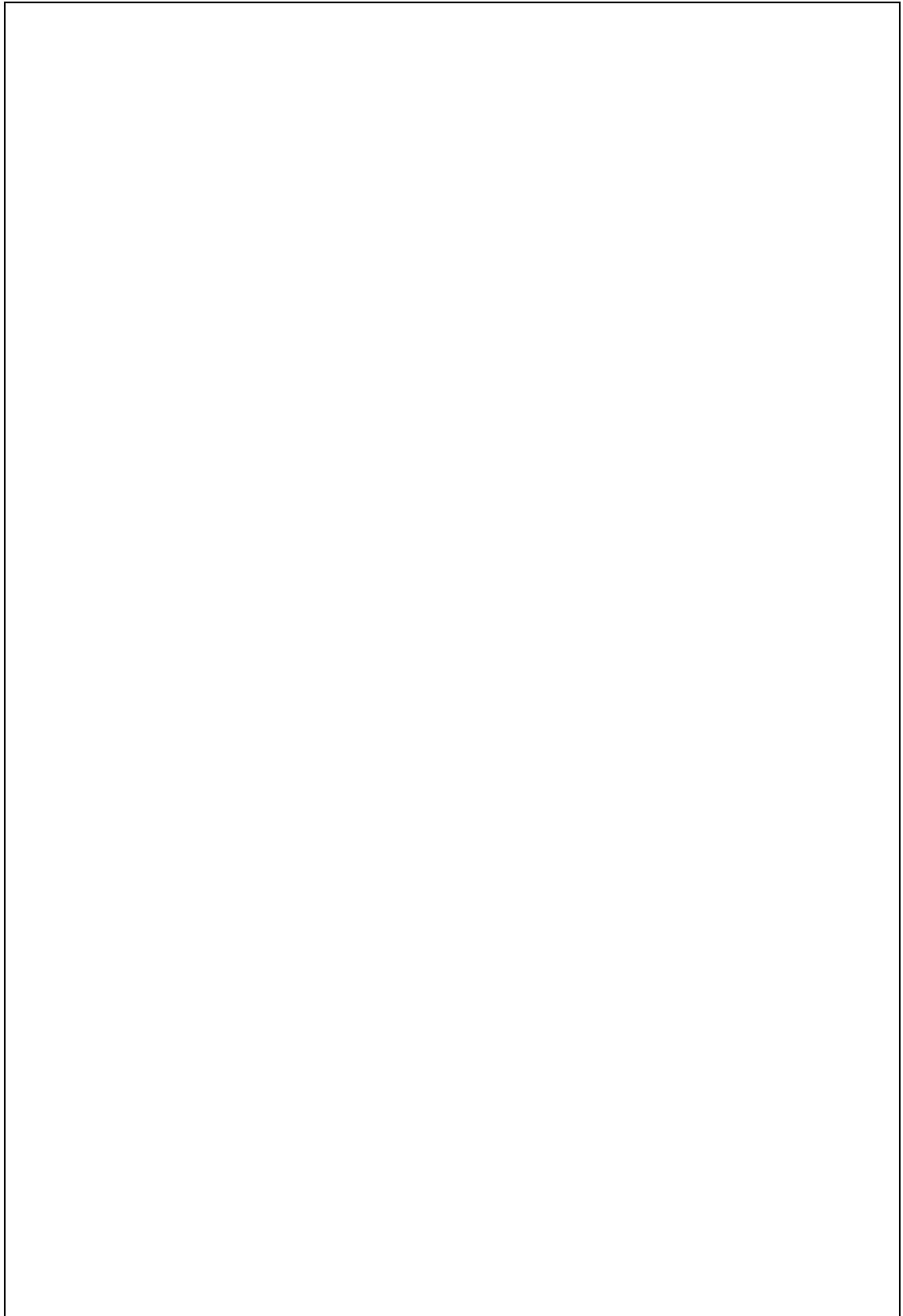
**Figure 6**



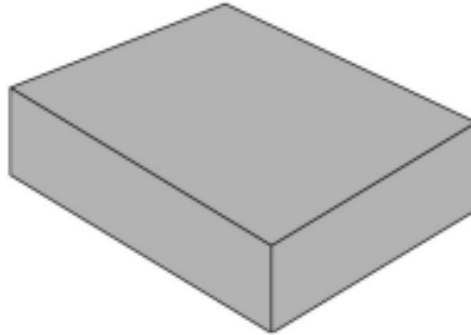
The front and side views are drawn in third angle projection.

Complete a two-point perspective drawing of the bug box in the space provided below

**[4 marks]**



**Turn over for the next question**

**2 6****Figure 7** shows the base for a basketball stand.**Figure 7****2 6 . 1****Table 7** gives the details of the internal volume of the base.**Table 7**

<b>Internal dimensions of the base</b>	<b>Length</b>	<b>Width</b>	<b>Depth</b>
	600 mm	450 mm	200 mm

Calculate the internal volume of the base in **cm<sup>3</sup>****[2 marks]**

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Answer \_\_\_\_\_ **cm<sup>3</sup>**



**2 6 . 2**

To stop the basketball stand from falling over, the hollow base is filled with dry sand.

The sand has a density of  $1.6 \text{ g per cm}^3$ .

Calculate the mass of sand needed to fill the base.

Give your answer to the nearest whole kg.

**[3 marks]**

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**Turn over for the next question**



2 8

Focus groups and market research are used by designers to gather information before designing products.

Use **one** example for **each** technique and describe how they would be used to help design products.

[6 marks]

Focus groups \_\_\_\_\_

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Market research \_\_\_\_\_

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### END OF QUESTIONS

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**Figure 1:** 671414190 Switch on White © iStock.com/Kraysuk

**Figure 3:** 1132784047 blank packaging for milk © iStock.com/MileA

**Figure 4:** 157739912 Wooden colored toy train - bunte Holzeisenbahn © iStock.com/wakila

**Table 2:** 178641327 Can opener © iStock.com/LeventKonuk  
 183793060 wooden toy train © iStock.com/JoKMedia  
 510863936 Nike Shoe box © iStock.com/LPETTET  
 648668478 Plastic gears © iStock.com/andy0man

**Table 6:** 910778862 Japanese kettle © iStock.com/akiyoko  
 539126402 Blue plastic electric kettle © iStock.com/pioneer111  
 1053048142 Whistling Kettle © iStock.com/alekseykolotvin28