Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2016

Technology and Design

Unit 1: Technology and Design Core

MV18

[GTD11]

TUESDAY 24 MAY, MORNING

Time

1 hour, plus your additional time allowance.

Instructions to Candidates

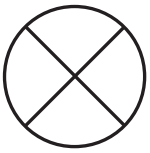
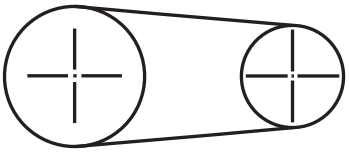
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Questions which require drawing or sketching should be completed using an H.B. pencil.
All other questions must be completed in blue or black ink only.
Answer **all** questions.

Information for Candidates

The total mark for this paper is 90.
Quality of written communication will be assessed in Question **11**.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

1 **Table 1** shows a number of different symbols. Using the first row as a guide, complete the table. [9 marks]

Table 1

Sketch of Symbol	Type of Symbol	Name of Symbol
	Electronic	Bulb
		SPST Switch
	Mechanical	
		
		Wear hand protection
		Primary or Secondary cell (Battery)
		Pressure Source

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(Questions continue overleaf)

2 **Fig. 1** shows a designer working with a CAD package.

Fig. 1

(a) Give **two** benefits of using the CAD process.
[2 marks]

(b) When the CAD design is completed the file is downloaded to a CNC machine.

Name **three** CNC machines that may be used in a school workshop. [1 mark for each]

Machine 1: _____

Machine 2: _____

Machine 3: _____

(c) The CAM process is used in industry; give **one** benefit of using this process. [1 mark]

_____

_____

3 **Fig. 2** shows a mechanism for winding a cable on to a drum. The drum is turned by a system of gears using a handle as shown.

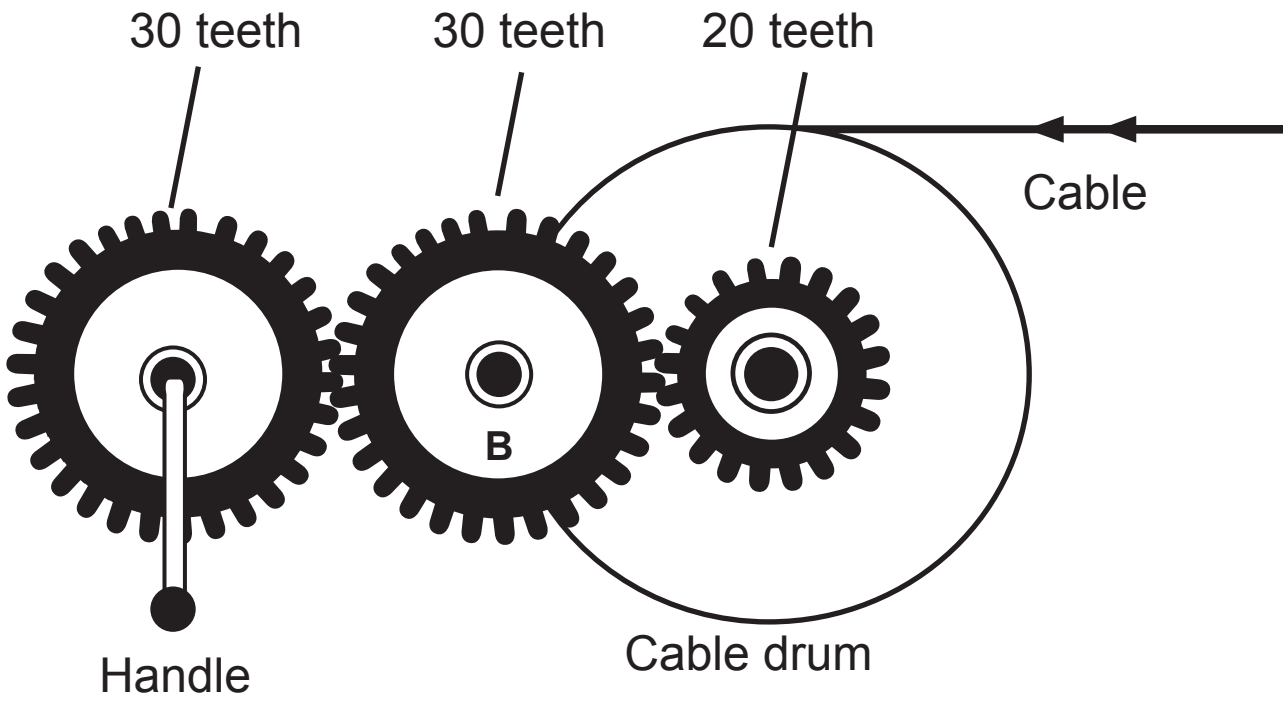

Fig. 2

(i) State the type of: [2 marks]

- Input motion _____
- Output motion _____

(ii) Mark on **Fig. 2** the direction in which the handle should be turned in order to wind the cable on to the drum. [1 mark]

(iii) If the handle is turned at 60 rev/min, determine:

- The speed of wheel B [1 mark] _____
- The speed of the drum [2 marks] _____

_____

(iv) Name another mechanism which could be used to connect two parallel shafts. [1 mark]

_____

4 **(a)** **(i)** Explain what is meant by a thermoplastic material. [1 mark]

_____

_____

(ii) Give **two** methods which can be used to shape a sheet of thermoplastic material. [2 marks]

1. _____

2. _____

(b) **Fig. 3** shows a stand used to display a book in a library.

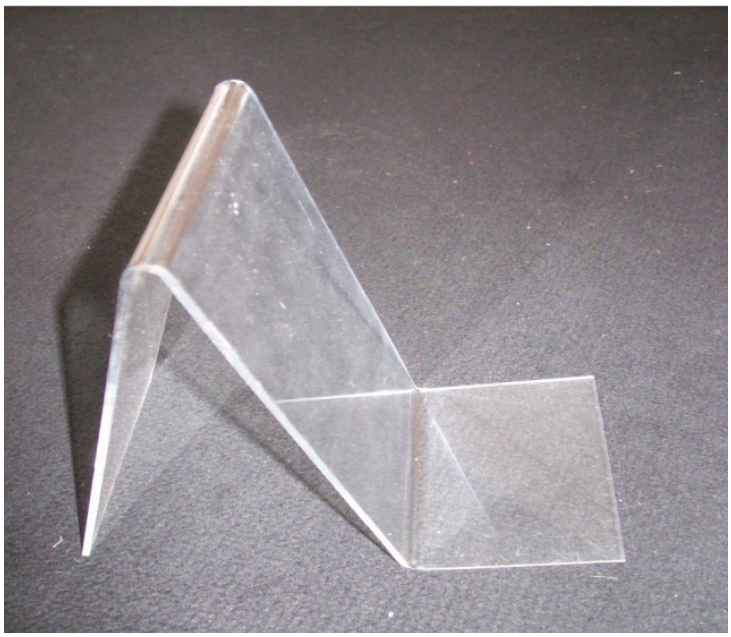

Fig. 3

(i) Suggest a suitable thermoplastic material for the stand. [1 mark]

_____

(ii) Give **two** reasons why a jig should be used in shaping the stand. [2 marks]

1. _____

2. _____

5 Current, voltage, and resistance are three common terms used in electronics.

(a) State the name of each electronic unit used to measure current, voltage and resistance. [3 marks]

Current _____

Voltage _____

Resistance _____

(b) Resistors are used with LEDs in electronic circuits. Draw the circuit symbol for a resistor and a LED. [3 marks]

Resistor

LED

(c) A 3.3 kΩ resistor is to be used in an electronic circuit. Use the information below to identify the colour code for the first three bands shown on the resistor.
[1 mark for each]

0 = Black
1 = Brown
2 = Red
3 = Orange
4 = Yellow
5 = Green
6 = Blue
7 = Violet
8 = Grey
9 = White

Band 1 colour _____

Band 2 colour _____

Band 3 colour _____

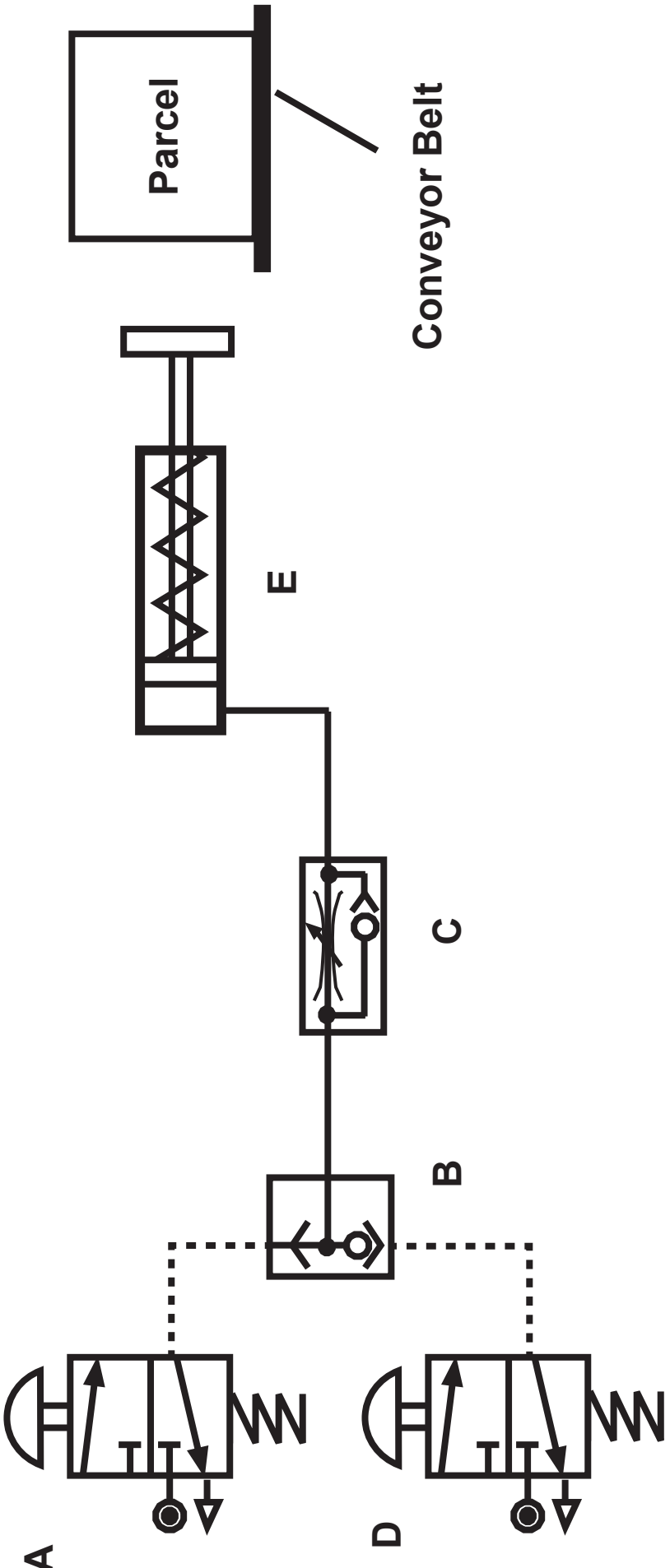

Fig. 4

6 **Fig. 4** on page 12 shows a pneumatic circuit for removing parcels from a conveyor belt.

(i) Name the components **A**, **B** and **C**. [3 marks]

A _____

B _____

C _____

(ii) State **one** safety check which should be carried out before testing the circuit. [1 mark]

_____

(iii) Explain how the circuit operates to remove a parcel from the conveyor belt by referring to the function of each of the components **A**, **B**, **C**, **D** and **E**. [5 marks]

Component **A** _____

_____

Component **B** _____

_____

Component **C** _____

_____

Component **D** _____

_____

Component **E** _____

_____

7 **Fig. 5 (a)** shows an aluminium photo frame holder.
Fig. 5 (b) shows the pattern for making the aluminium holder. This is to be shaped to enable a photograph with a card backing to slide down into the frame as shown.

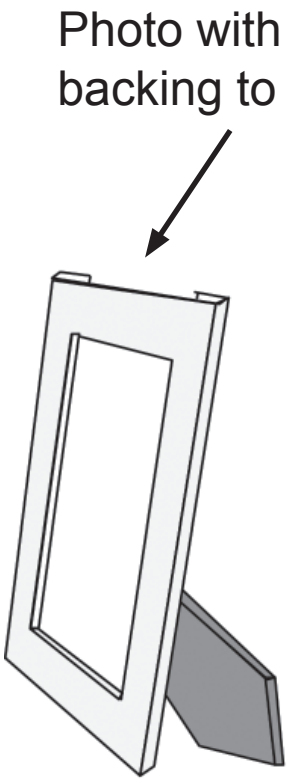

Fig. 5 (a)

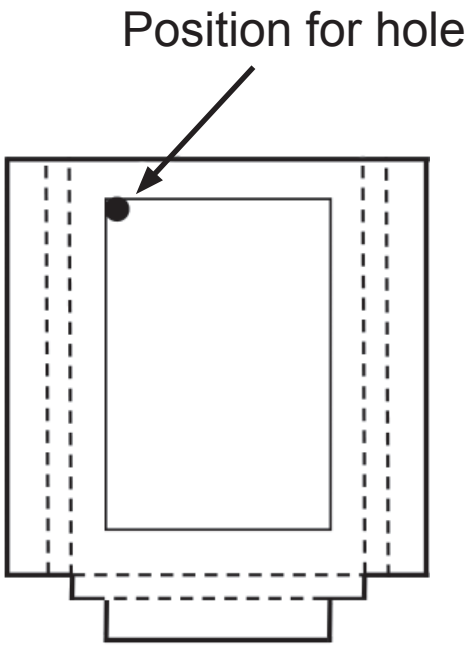

Fig. 5 (b)

The centre part of the aluminium is to be removed for the picture to be seen. To start this process a hole is drilled in the corner as shown in **Fig. 5 (b)**.

(a) Outline the purpose of drilling this hole. [2 marks]

(b) Name the **two** tools used to mark the centre of the hole in preparation for drilling. [2 marks]

(i) _____

(ii) _____

(c) Suggest how the sides of the holder as shown by the dotted lines could be bent to produce the shape shown in **Fig. 5 (a)**. [2 marks]

_____

8 Four electronic components are each described by the following statements **A**, **B**, **C** and **D**.

A The component functions as an electronic switch when a voltage of 0.7 volts is applied at the base leg.

B The component responds to changes in light levels.

C The component makes an audible noise when operated.

D The component responds to changes in temperature to function.

(a) Complete **Table 2** by naming the electronic component that is described by each statement. [4 marks]

Table 2

Letter	Name of Electronic Component
A	
B	
C	
D	

(b) The circuit shown in **Fig. 6** requires completion by correctly adding the three component symbols described by the statements **A**, **C** and **D**. Complete the circuit by adding the missing circuit symbols. [6 marks]

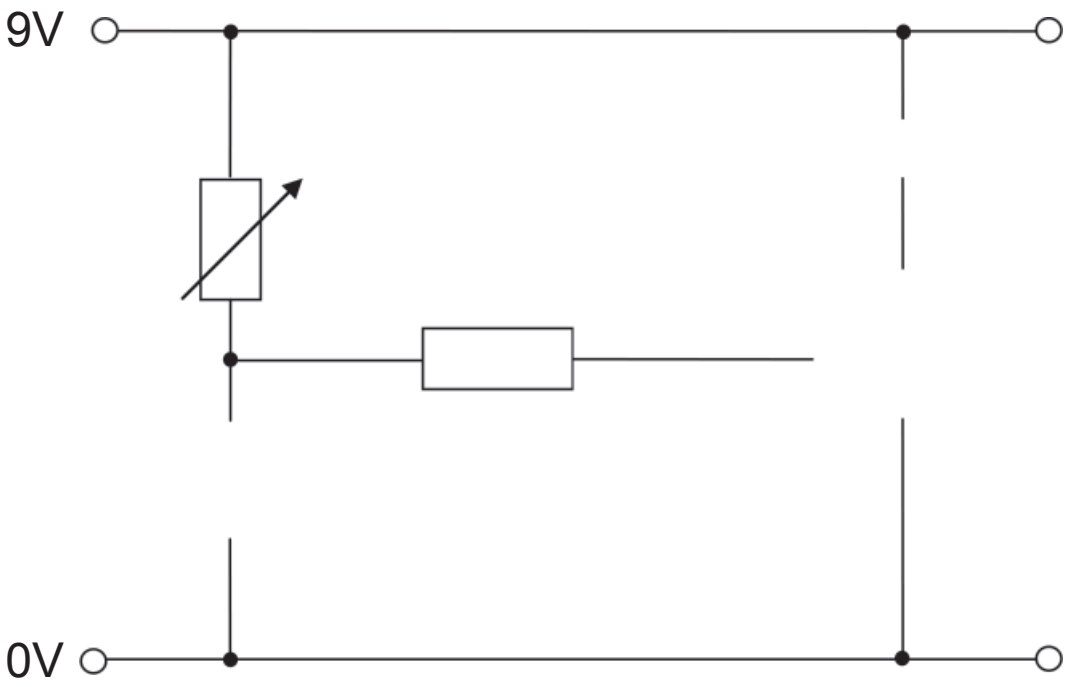

Fig. 6

9 **Fig. 7** shows an outline plan view of the layout of a semi-automatic barrier system for a car park.

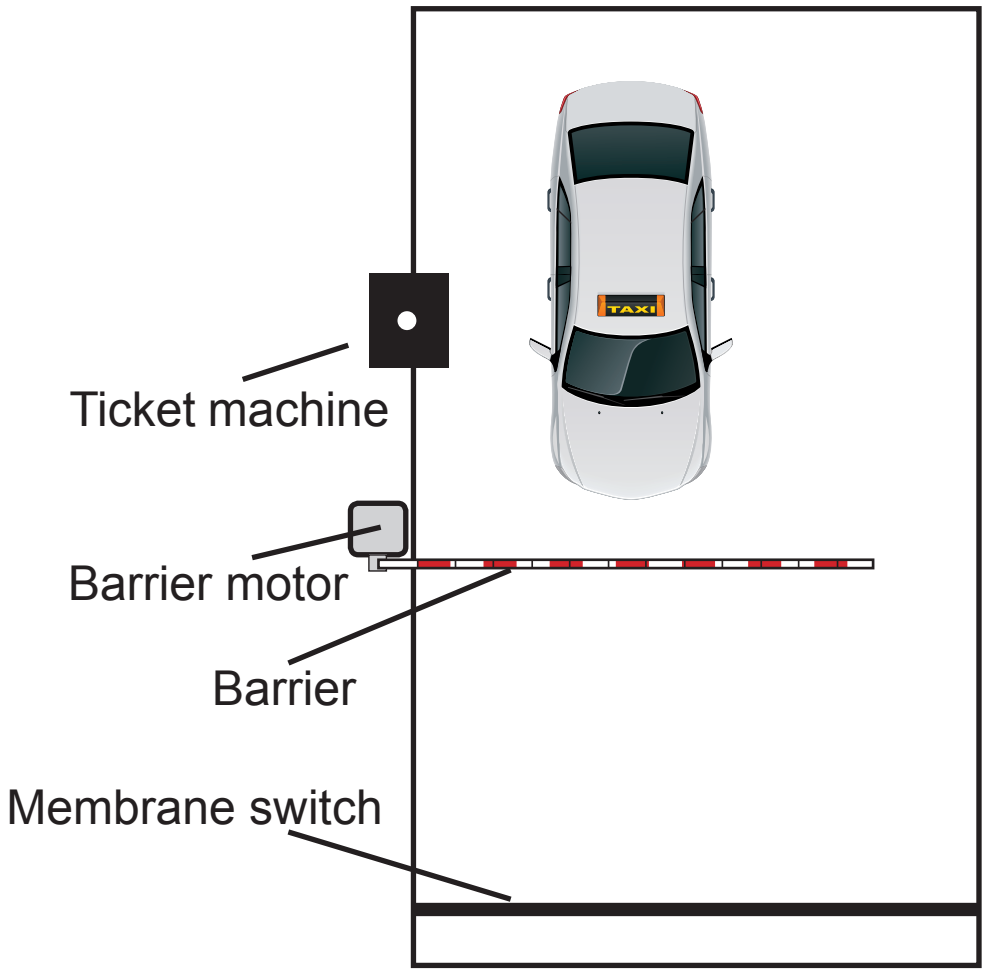

Fig. 7

The barrier is activated by inserting a ticket. When the ticket is inserted, the barrier motor rotates to lift the barrier to the open position. It takes 6 seconds for the barrier to reach the fully open position before the barrier motor is turned off. A membrane switch on the road detects when the car has moved past the barrier. The barrier motor then rotates to lower the barrier to the closed position. The time taken for the barrier to close is 6 seconds. The motor then is turned off and the program ends.

Complete the flow chart in **Fig. 8** to illustrate the program to control the automatic barrier at a car park. [9 marks]

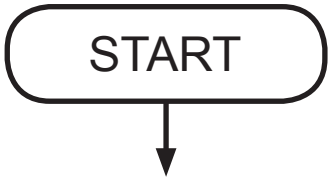

Fig. 8

10 **Fig. 9** shows a pair of hedge shears.

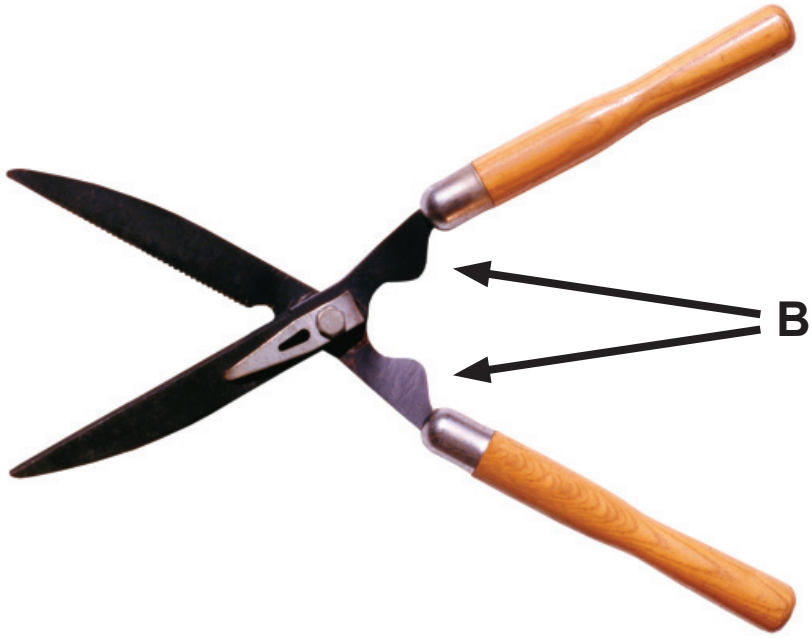

Fig. 9

(i) Suggest a suitable material for the blades and the handles. [4 marks]

Give a reason, other than cost, for your choice.

Blade material _____

Reason _____

Handle material _____

Reason _____

(ii) Name the mechanism used in the shears. [1 mark]

_____

(iii) Give **one** advantage of using shears with longer handles. [2 marks]

_____

_____

(iv) Suggest a reason for the design features at **B**. [2 marks]

_____

_____

11 Dowel joints are used in the construction of a wooden frame. The frame is to be made using four pieces of mahogany each 400 mm long, 60 mm wide, 15 mm thick. Each of the four corner joints should be constructed using **two** dowels.

For **one corner**, describe the process of preparing the two ends of the wood; marking out; making and assembling the two dowel joint structure. When the joint is constructed it should be a permanent structure and the dowels should not be seen. Make reference to any appropriate safety precautions used in this process. [10 marks]

The quality of written communication will be assessed in this question.

THIS IS THE END OF THE QUESTION PAPER

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Q3 - - - - Fig. 2 © CCEA
Q4(b) - - - Source: Chief Examiner
Q7(a) - - - Fig 5 © CCEA
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Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total Marks	

Examiner Number