



General Certificate of Secondary Education
January 2019

Centre Number

--	--	--	--	--

Candidate Number

--	--	--	--	--

Technology and Design

Unit 1:

Technology and Design Core



[GTD11]

GTD11

WEDNESDAY 9 JANUARY, AFTERNOON

TIME

1 hour.

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.

Do not write outside the boxed area on each page or on blank pages.

Questions which require drawing or sketching should be completed using an H.B. pencil.

All other questions must be completed using black ink only.

Do not write in pencil or with a gel pen.

Answer **all eleven** 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 down the right-hand side of pages indicate the marks awarded to each question or part question.



BLANK PAGE
DO NOT WRITE ON THIS PAGE

11530



24GTD1102

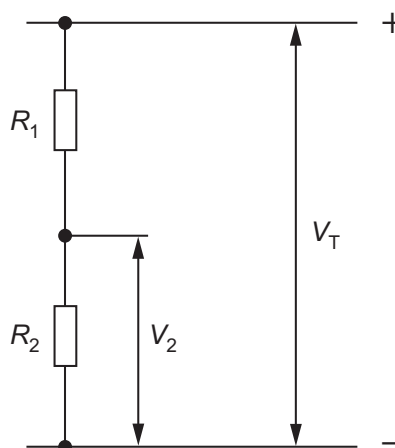
Formulae for GCSE Technology and Design

You should use, where appropriate, the formulae given below when answering questions which include calculations.

1 Potential Difference = current $\times$ resistance ($V = I \times R$)

2 For potential divider

$$V_2 = \frac{R_2}{R_1 + R_2} \times V_T$$



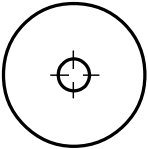
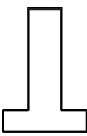
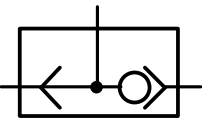
3 Series Resistors $R_T = R_1 + R_2 + R_3 \text{ etc.}$

4 Gear ratio of a simple gear train = $\frac{\text{number of teeth on driven gear}}{\text{number of teeth on driver gear}}$



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

Table 1

Sketch of Symbol	Type of Symbol	Name of Symbol
	Electronic	Bulb
	Electronic	Ammeter
		
		Thermistor
	Hazard	
		
	Pneumatic	



2 (a) What is the function of a computer aided design software package?

[1]

(b) Explain the difference between the two terms, computer numerical control (CNC) and computer aided manufacture (CAM).

[2]

(c) **Fig. 1** shows a photograph of a wooden block to be shaped on a CNC machine. The three main cutting axes of the machine are shown in **Fig. 1**. They are the X-axis, the Y-axis and the Z-axis.

Correctly label the three axis lines shown in **Fig. 1**.

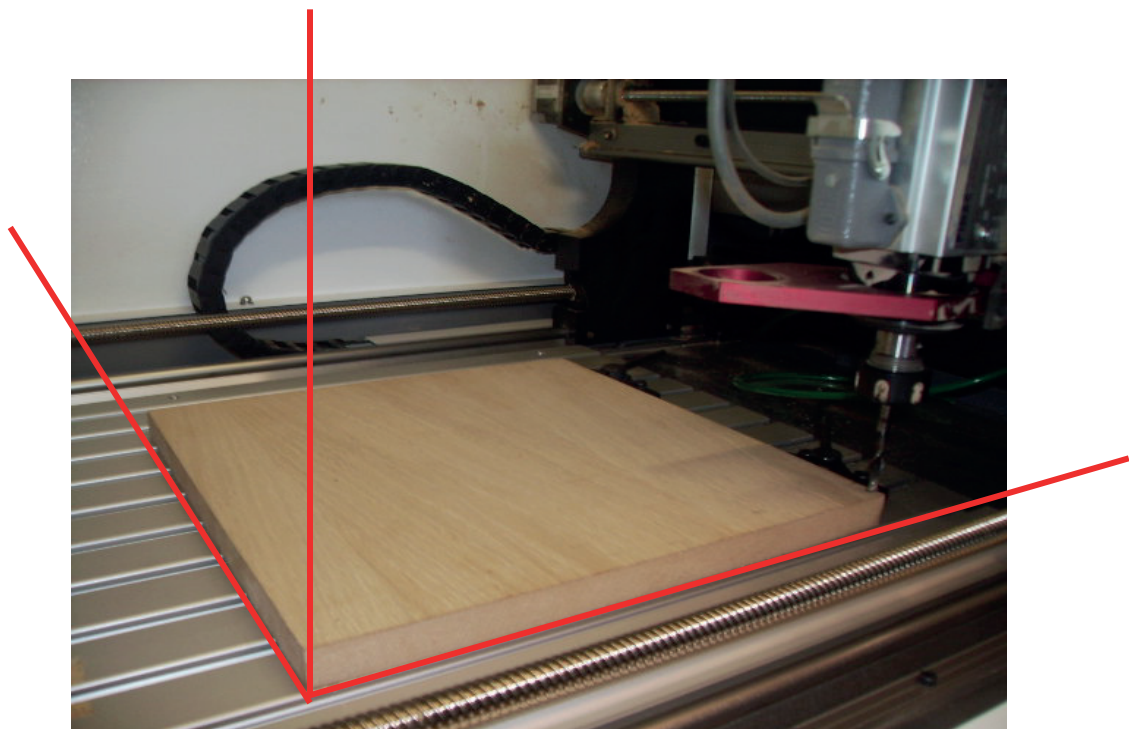


Fig. 1

Source: Principal Examiner

[3]

[Turn over



BLANK PAGE
DO NOT WRITE ON THIS PAGE

11530



24GTD1106

3 Fig. 2 illustrates two common mechanical systems labelled as **A** and **B**.

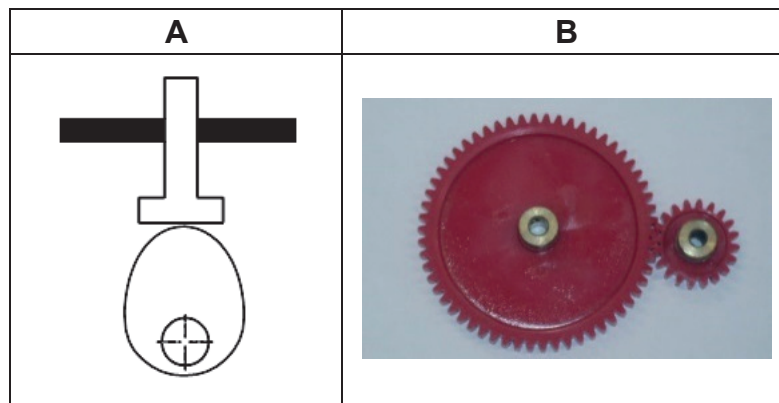


Fig. 2

Name each mechanical system and outline its purpose.

Name **A** _____ [1]

Purpose of **A** _____

_____ [2]

Name **B** _____ [1]

Purpose of **B** _____

_____ [2]

[Turn over



4 **Fig. 3** shows a pneumatic press.

(a) State **one** other application of pneumatics.

[1]

The pneumatic press shown in **Fig. 3** is used for stamping components. **A** and **B** are two different methods of actuation. **A** is activated when the guard is lowered. **B** is operated externally by hand.

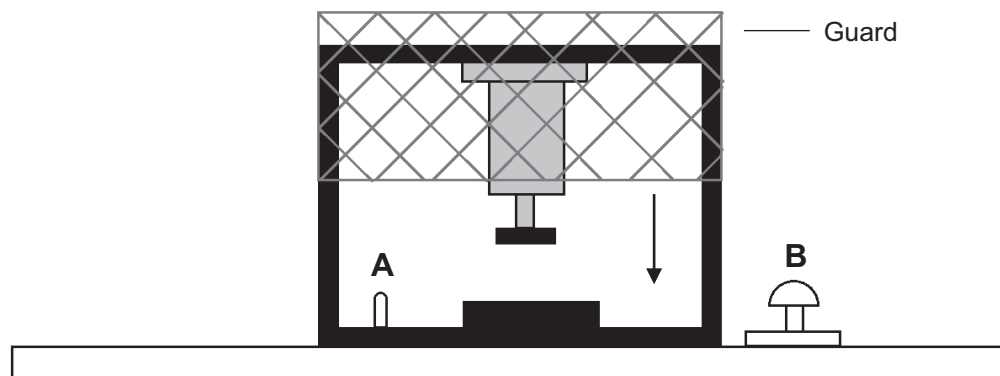


Fig. 3

Fig. 4 shows the layout of the pneumatic circuit used to make the press work.

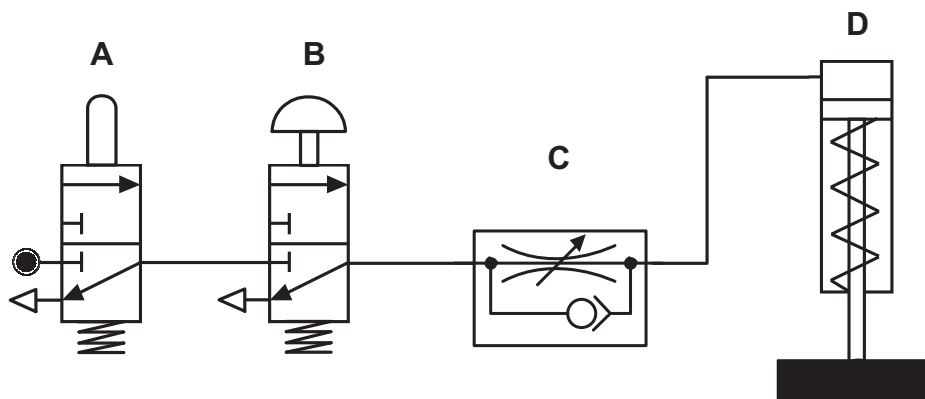


Fig. 4



(b) Name the actuation methods of component **A** and component **B** in **Fig. 4**.

Actuation method **A** _____

Actuation method **B** _____ [2]

(c) Write down the name of the component labelled **C** in **Fig. 4**.

_____ [1]

(d) Explain the purpose of component **C** as used in this circuit.

_____ [2]

(e) Explain how component **D** can be made to operate.

_____ [2]

[Turn over



BLANK PAGE
DO NOT WRITE ON THIS PAGE

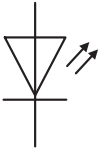
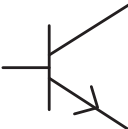
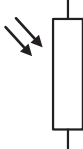
11530



24GTD1110

5 (a) **Table 2** shows five electronic circuit symbols. The first one has been named. Complete **Table 2** by inserting the names of the other four electronic circuit symbols.

Table 2

				
Light Emitting Diode (LED)				

[4]

(b) **Fig. 5** shows a part completed circuit diagram. Complete **Fig. 5** by inserting **all five** electronic symbols shown in **Table 2** to enable the Light Emitting Diode to operate in dark conditions.

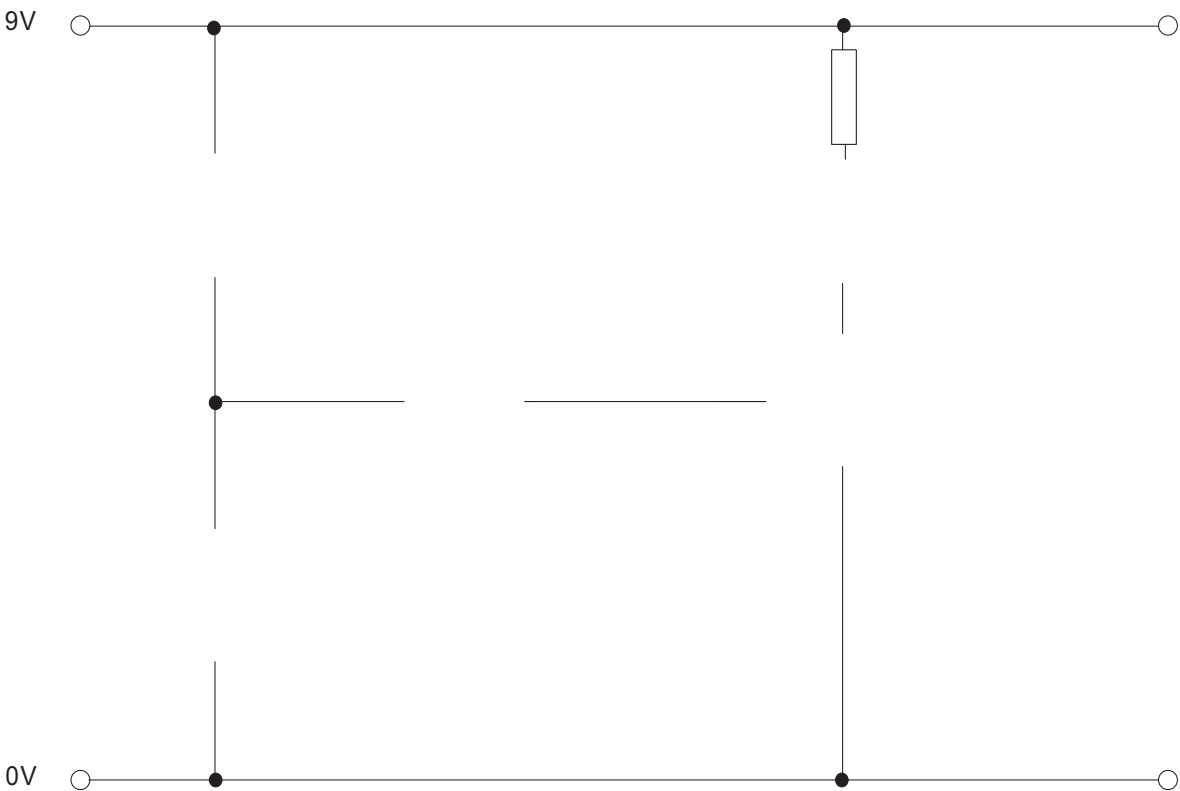


Fig. 5

[5]

[Turn over]



- 6 **Fig. 6(a)** shows an exploded view of the hinge mechanism used in a child's mechanical toy. A piece of paper is inserted between the aluminium alloy bars to provide ease of movement. All the pieces are to be joined together by means of the solid rivet shown in **Fig. 6(b)**.

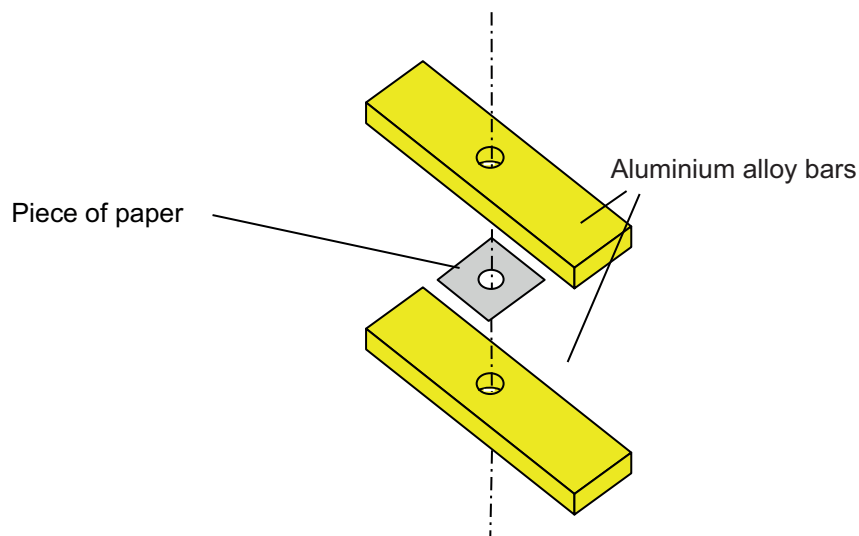


Fig. 6(a)



Fig. 6(b)

- (a) Name the type of rivet shown in **Fig. 6(b)**.

_____ [1]

- (b) Give a reason why a mild steel rivet would be unsuitable for this joining process.

_____ [1]



- (c) When the joining process is completed, the rivet is formed to have the same shape on both sides of the joint.

List **three** stages in making this rivet joint in a school workshop.

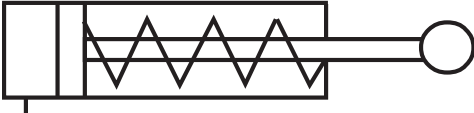
[3]

[Turn over



7 **Table 3** shows a number of pneumatic component symbols.

Table 3

Pneumatic Symbol	Name of Symbol
	
	
	

[3]

(a) Complete **Table 3** by selecting the correct name for each symbol from **Table 4**.

Table 4

3/2 Valve
Single Acting Cylinder
Shuttle Valve
Unidirectional Flow Restrictor
Pressure Source

(b) Name the pneumatic control symbols shown in **A** and **B** below.



A



B

A _____ **B** _____

[2]



(c) Explain the function of component **A** in a pneumatic circuit.

[2]

(d) Look at **Fig. 7**. It shows a brake which is applied to a wheel by a pneumatic cylinder.

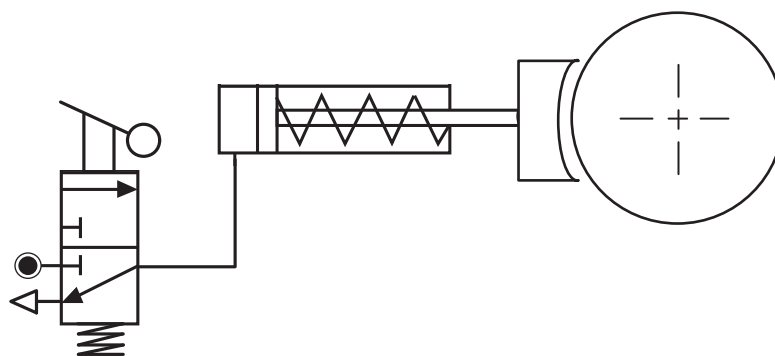


Fig. 7

Tick the correct box for each of the following:

(i) The valve shown is operated by:

A button

☐

A lever

☐

(ii) The spring in the cylinder is used to:

Apply the brake

☐

Release the brake

☐

[2]

[Turn over



8 (a) (i) Name the component labelled **A** in **Fig. 8**.

[1]

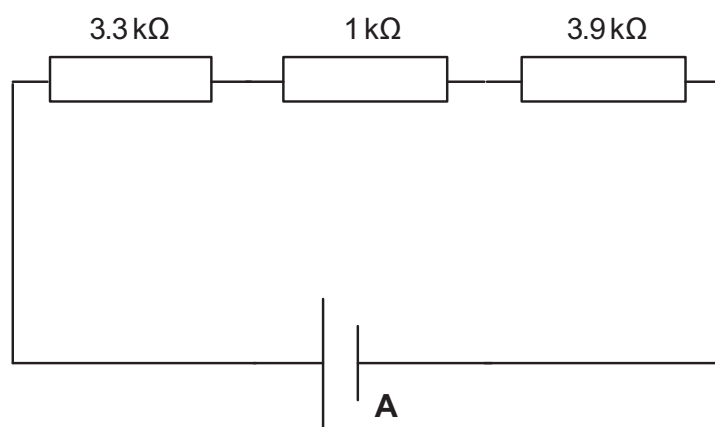


Fig. 8

(ii) Name the type of circuit shown in **Fig. 8**

[1]

(iii) Calculate the value of the single resistor which could replace the three resistors shown in **Fig. 8**.

Answer _____ [2]



- (iv) Resistors have a wide range of values and the colour bands on the body of a resistor are used to identify the value of a specific resistor.

Using the information below, identify the colour of the first three bands of the $3.9\text{k}\Omega$ resistor shown in **Fig. 8**.

0 = Black 1 = Brown 2 = Red 3 = Orange 4 = Yellow

5 = Green 6 = Blue 7 = Violet 8 = Grey 9 = White

Colour of Band 1 _____

Colour of Band 2 _____

Colour of Band 3 _____ [3]

- (b) Name the component shown in **Fig. 9** and identify each of the three connections labelled **X**, **Y** and **Z**.

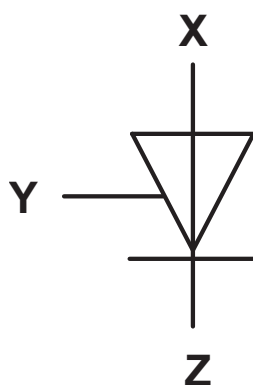


Fig. 9

Component _____

X _____

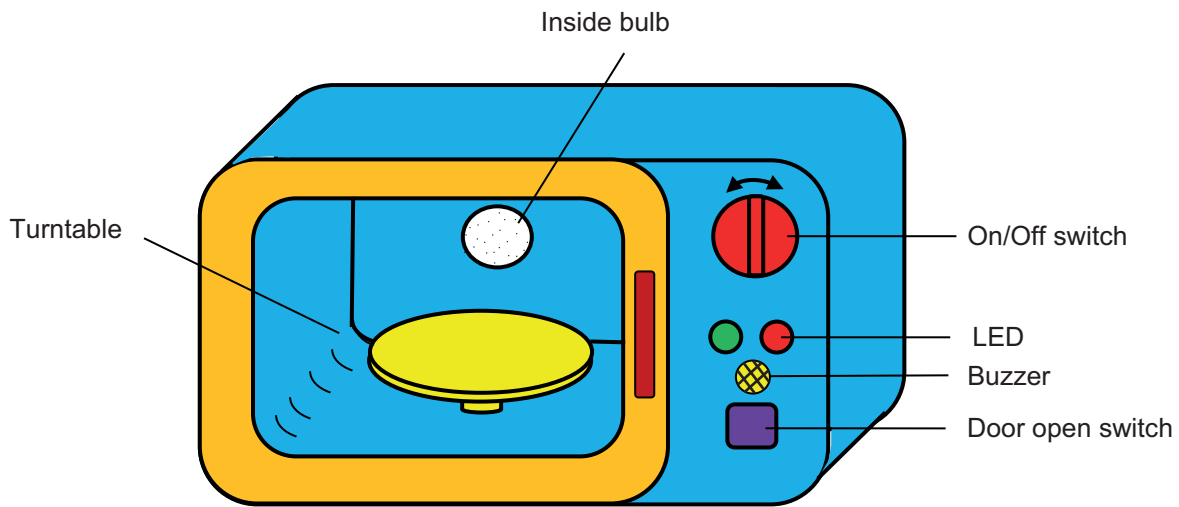
Y _____

Z _____ [4]

[Turn over]



- 9 **Fig. 10** shows a sketch of a toy microwave for a child. It is to be programmed to operate in a set sequence.



Source: Principal Examiner

Fig. 10

When the switch is turned on a green LED will come on. Three seconds later a motor rotates the turntable and at the same time the inside bulb comes on. After thirty seconds the motor turns off. Three seconds later, a buzzer and red LED come on for five seconds only. Two seconds later the inside bulb and green LED also go off as the program ends.



Complete the flow chart in **Fig. 11** to illustrate the program to operate the toy microwave.



Fig. 11

[11]

[Turn over



- 10 Fig. 12 shows a mechanical system that makes use of three gear wheels labelled **A**, **B** and **C**. The driver gear is gear wheel **C**.

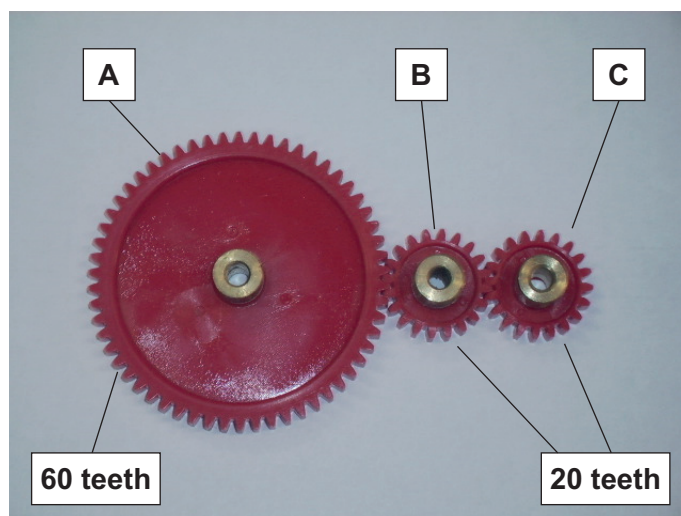


Fig. 12

- (a) What is the mechanical system in Fig. 12 called?

_____ [1]

- (b) What advantage does this system have compared to a pulley system?

_____ [1]

- (c) What is the function of the middle gear **B**?

_____ [2]



- (d) Calculate how many turns gear **C** needs to make to produce **one** turn of gear **A** in **Fig. 12**.
(Show your working out)

Answer _____ [2]





[10]

THIS IS THE END OF THE QUESTION PAPER



DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	

Total Marks	
-------------	--

Examiner Number

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.

