



General Certificate of Secondary Education
2018

Centre Number

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Candidate Number

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Technology and Design

Unit 1:

Technology and Design Core

MV18

[GTD11]

WEDNESDAY 23 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.

Do not write 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 at the end of each question indicate the marks awarded to each question or part question.

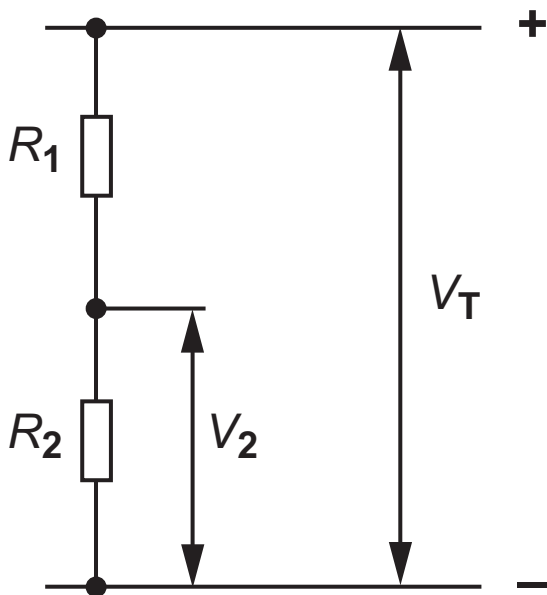
Formulae for GCSE Technology and Design

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

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




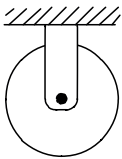


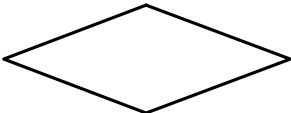
3 Series Resistors $R_T = R_1 + R_2 + R_3$ etc.

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

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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
		Variable Resistor
		
	Electronic	Push to make switch
		
		Single Acting Cylinder
		Decision

- 2 **Fig. 1** shows a soccer club badge design. It is intended that the badges will be sold as key fobs to raise funds for the team. A large quantity of acrylic key fobs is to be manufactured using a CNC machine.

Using the stages below, complete the boxes in the flowchart to show the correct sequence for the design and manufacture of the badge. [4 marks]



Fig. 1

Stages in the process:

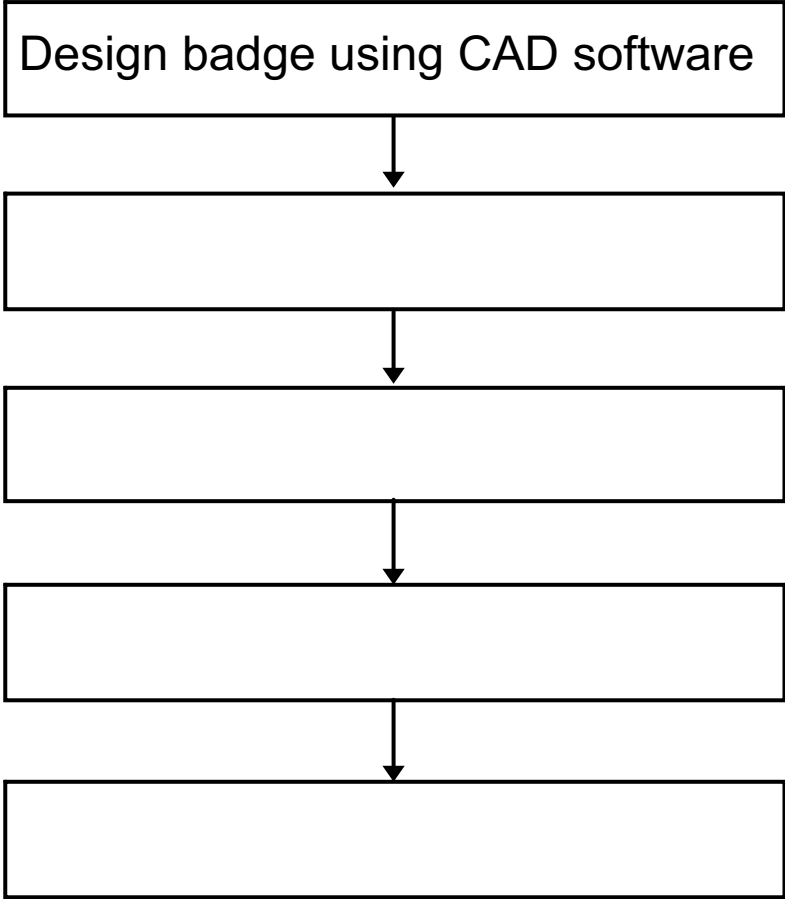
Design badge using CAD software

Manufacture using CNC machine

Simulate manufacture

Convert design into CNC code

Insert acrylic into the CNC machine



3 **Fig. 2** shows a gear system and a belt system for transmitting motion from a motor to an output shaft.

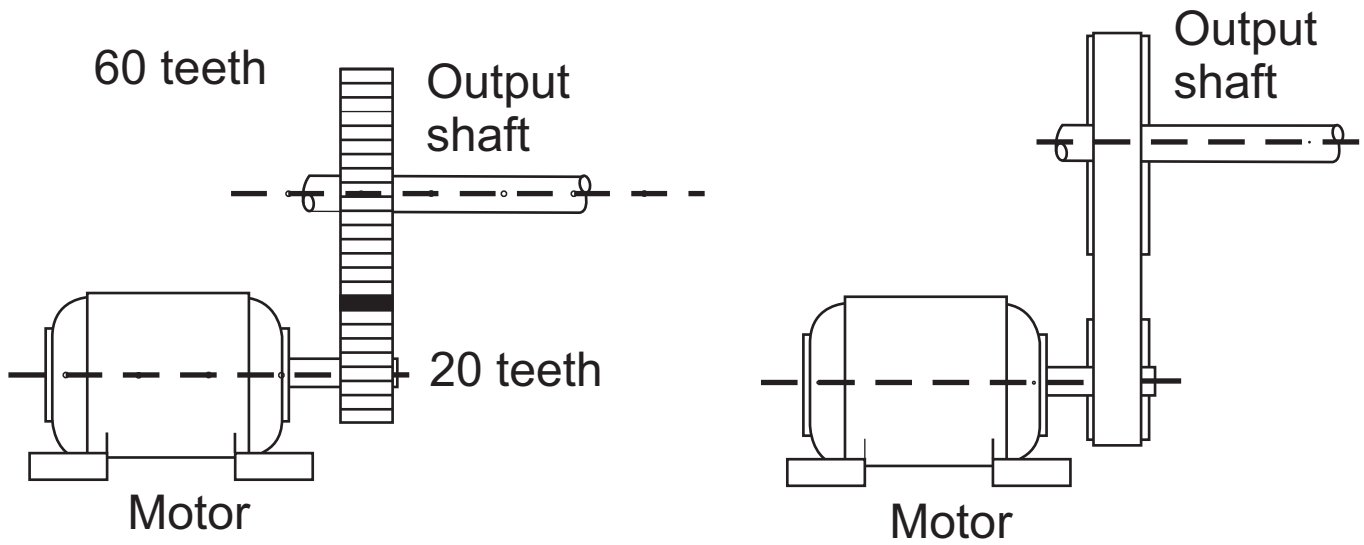
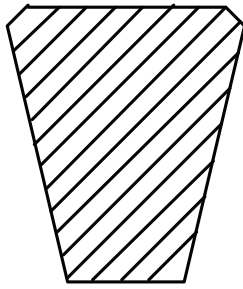


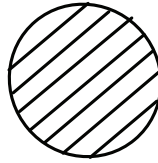
Fig. 2

(a) State the type of motion transmitted from the motor to the output shaft. [1 mark]

(b) **Fig. 3** shows the cross section of two types of belt.



Belt 1



Belt 2

Fig. 3

(i) Name the types of belt shown in **Fig. 3**. [2 marks]

Belt 1: _____

Belt 2: _____

(ii) Which one of the belts in **Fig. 3** would be used in a pillar drill? [1 mark]

(c) Outline how the gear system in **Fig. 2** could be changed so that the motor and the shaft rotate in the same direction. [1 mark]

(d) (i) Which transmission in **Fig. 2** would be used if the distance between the motor and the output shaft is large? [1 mark]

(ii) Which system would be used if an exact speed ratio is required? [1 mark]

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4 **Table 2** lists a number of surface finishes which are applied to materials.

Table 2

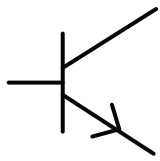
Application Surface finish	External Mahogany door	Mild Steel rubbish bin	Softwood fence	Plastic sheet
Galvanising				
Varnishing				
Polishing				
Preservative Staining				

(a) For each application insert a tick (✓) in the box for the **most suitable** finish. [4 marks]

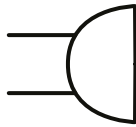
(b) State **two** benefits of applying a surface finish to a bicycle frame. [2 marks]

1. _____
2. _____

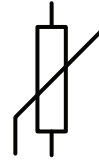
5 Three electronic symbols are shown in **Fig. 4** below.



(a)



(b)



(c)

Fig. 4

(i) Name the component represented by each of the electronic symbols shown in **Fig. 4**. [3 marks]

Symbol (a) _____

Symbol (b) _____

Symbol (c) _____

Fig. 5 shows a part completed circuit diagram.

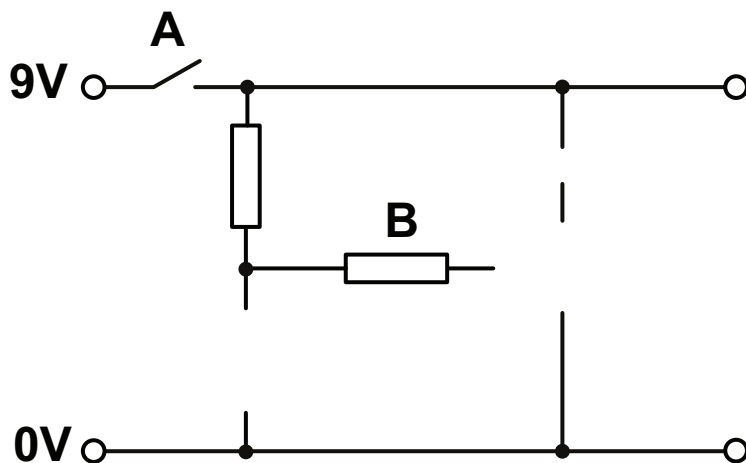


Fig. 5

(ii) Name the type of switch labelled **A** and the component labelled **B** in **Fig. 5**. [1 mark for each]

Switch **A** _____

Component **B** _____

(iii) Insert the **three** component symbols of **Fig. 4** into the circuit diagram shown in **Fig. 5** to enable it to operate. [3 marks]

(iv) Explain the function of each component represented by the symbols **(a)**, **(b)** and **(c)** in **Fig. 4** in the operation of the circuit.

Function of **(a)** _____

_____ [2 marks]

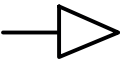


Function of **(b)** _____ [1 mark]

Function of **(c)** _____

_____ [2 marks]

- 6 (a) Name each of the symbols shown in **Table 3**.
[3 marks]

Table 3

Symbol	Name of Symbol
	
	
	

- (b) **Fig. 6** shows a pneumatic circuit used to apply brakes to a wheel.

- (i) State **two** methods which could be used to operate the brakes. [2 marks]

Method 1: _____

Method 2: _____

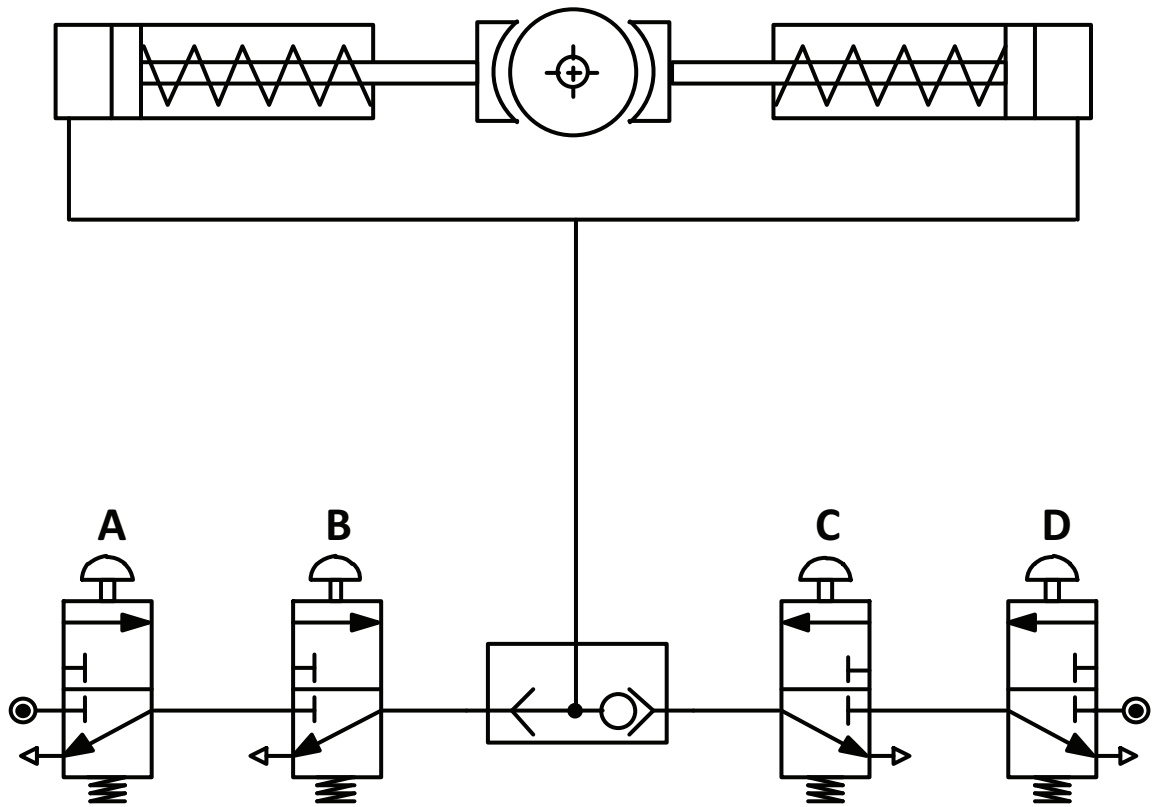


Fig. 6

(ii) Name the valve shown in **Fig. 7** below. [1 mark]

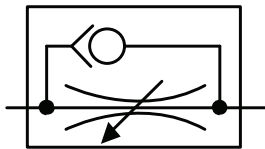


Fig. 7

Name the valve: _____

(iii) The valve shown in **Fig. 7** is to be fitted in the circuit to control the speed at which the brakes are applied.

Show on **Fig. 6** how the valve should be fitted in the circuit. [1 mark]

7 Fig. 8 shows a photograph of an incomplete child's toy made from MDF.

Fig. 9 shows a sketch of the mechanism used in the toy.

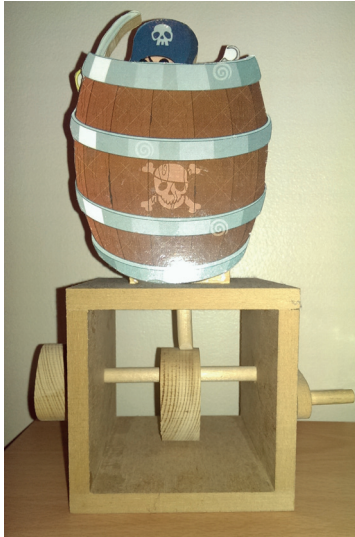


Fig. 8

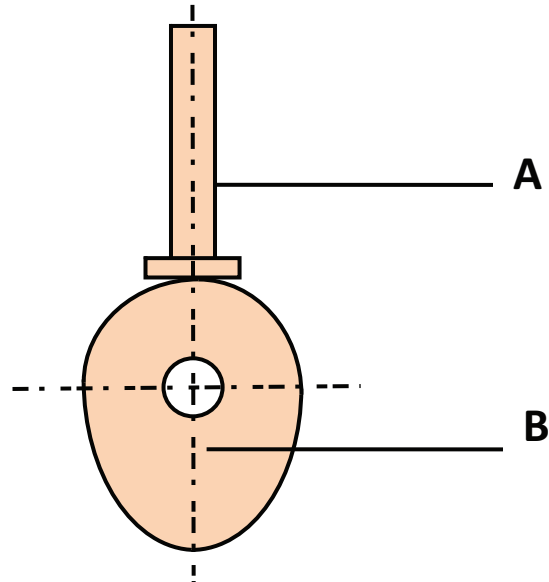


Fig. 9

(a) (i) What do the letters MDF represent? [1 mark]

MDF _____

(ii) Outline **two** advantages of using MDF compared to beech. [1 mark for each]

Advantage: _____

Advantage: _____

(b) Suggest an appropriate finish that should be applied to the MDF that is suitable for the child's toy. [1 mark]

(c) For safety reasons, two separate pieces of 3 mm thick acrylic are to be used to cover the front and back of the mechanism part of the toy.

Suggest a suitable method of attaching these pieces of acrylic that enables them to be removed if required.

[1 mark]

(d) (i) Name the mechanism used in the toy as shown in **Fig. 9**. [1 mark]

(ii) State the full name of each part labelled **A** and **B** in **Fig. 9**. [1 mark for each]

A _____

B _____

- 8 The resistor in **Fig. 10** has the following colours for the first three bands.

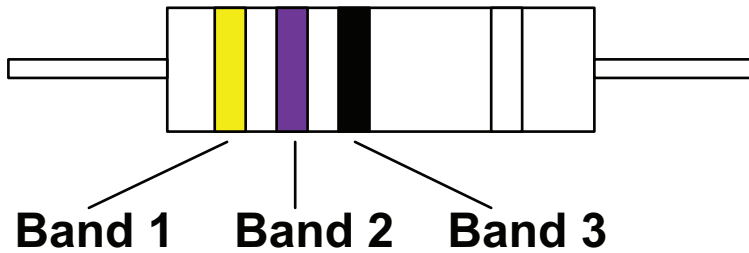


Fig. 10

Band 1 = Yellow, Band 2 = Violet, Band 3 = Black

- (a) Use the information below to work out its resistance value. [3 marks]

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

Resistance value: _____

(b) Fig. 11 shows a part completed circuit.

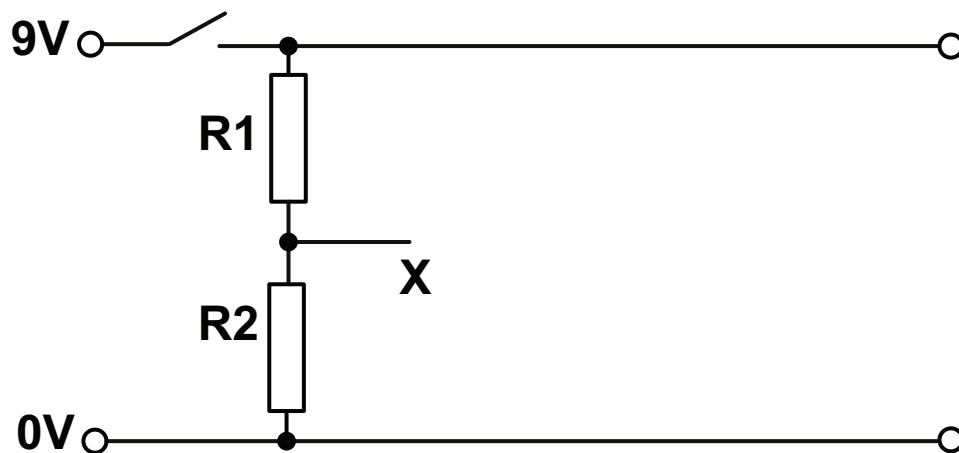


Fig. 11

(i) Given that the two resistors **R1** and **R2** in this circuit have the same value as the resistor shown in **Fig. 10** state the expected voltage output at point **X** in this circuit. [1 mark]

(ii) Without changing the supply voltage explain how the output voltage at point **X** could be **increased**. [2 marks]

(iii) Complete the circuit from point **X** in **Fig. 11** to enable an LED to operate when the switch is closed. [4 marks]

9 **Fig. 12** shows a picture of bicycles which are used in towns and cities.



Fig. 12

When an electronic payment is made it releases the lock holding the bicycle enabling it to be used.

An alarm is fitted to each bicycle, which will activate if the bicycle is moved or tampered with before payment is made. If the alarm is activated an LED will switch on for two seconds and then a buzzer will switch on for three seconds. This process will repeat unless an operator resets the system so that it may be reactivated.

Complete the flow chart in **Fig. 13** to illustrate the program to run the alarm system on the cycle only. [9 marks]

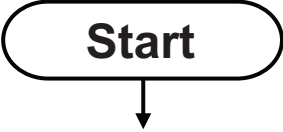


Fig. 13

10 Fig. 14 shows a stepladder. It is manufactured from aluminium alloy.

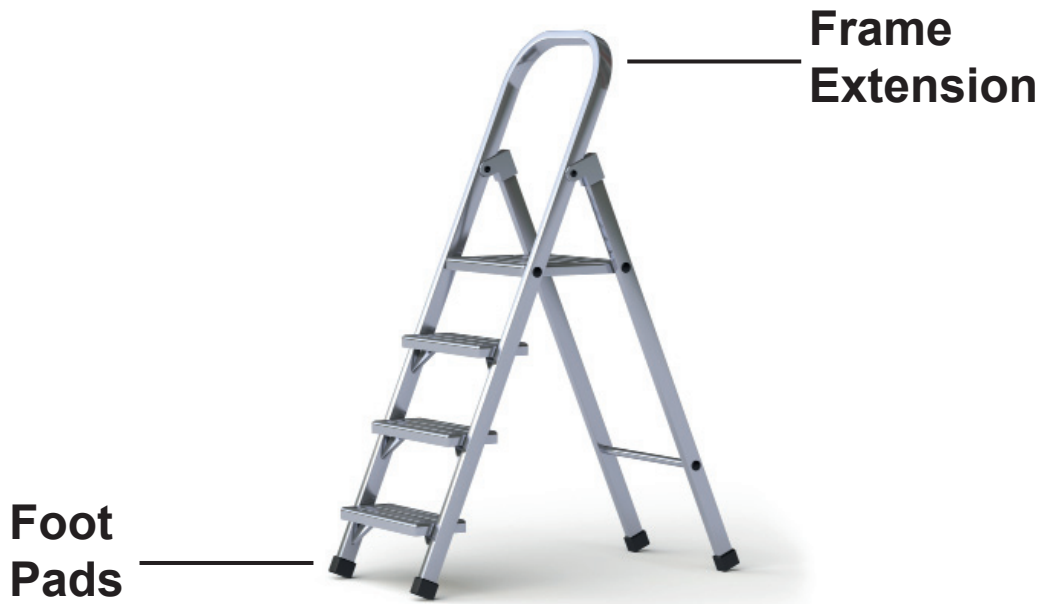


Fig. 14

(a) (i) State what is meant by an alloy. [1 mark]

(ii) Give **two** reasons why aluminium alloy is used to manufacture the stepladder. [2 marks]

1. _____

2. _____

(b) Suggest a reason for each of the following features of the stepladder. [2 marks]

Foot pads: _____

Extension of the frame at the top: _____

(c) Identify **two** other features of the stepladder shown.
[2 marks]

1. _____

2. _____

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Q7.....Source: Principal examiner

Q9.....© moodboard / Thinkstock

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For Examiner's use only	
Question Number	Marks
1	
2	
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11	
Total Marks	

Examiner Number

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