New Specification

Centre Number

71

Candidate Number

![CCEA Rewarding Learning logo]

**General Certificate of Secondary Education
2011**

Technology and Design

Unit 1:
Technology and Design Core

[GTD11]

GTD11

WEDNESDAY 25 MAY, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all eleven** questions.
On **page 3** we have provided formulae for you to use with this paper.

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.

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

6487

PLEASE NOTE:
On **page 3** we have provided formulae
for you to use with this paper.

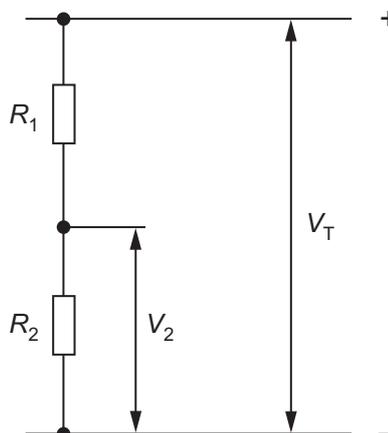Questions for this paper begin on **page 4**.

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 × resistance ($V = I \times R$)

2 For potential divider

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

3 Series Resistors $\quad R_T = R_1 + R_2 + R_3 \; etc$

Parallel Resistors $\quad \dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2} \quad$ or $\quad R_T = \dfrac{R_1 \times R_2}{R_1 + R_2}$

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

For a compound gear train:
Total Gear ratio = the product of the gear ratios of all the subsystems
i.e. $GR_T = GR_1 \times GR_2 \times GR_3 \dots$

5 Mechanical Advantage = $\dfrac{Load}{Effort}$

6 Velocity Ratio = $\dfrac{Distance\ moved\ by\ effort}{Distance\ moved\ by\ load}$

7 Pneumatics
Force = Pressure × Area ($F = P \times A$)

8 Time Constant $\quad T = R \times C$

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
		LED
		Flammable
	Computer Control	
	Electronic	

[9]

2 **Fig. 1** shows a typical school CNC machine. CNC machines are totally enclosed compared to manually operated machines that do a similar job.

Fig. 1

© Boxford Ltd

(a) List **three** safety features of a CNC machine.

Safety feature 1:

_____

Safety feature 2:

_____

Safety feature 3:

_____ [3]

(b) Other than safety, list **two** advantages in manufacturing products using a CNC machine compared with manufacturing the same products manually.

Advantage 1:

_____

_____

Advantage 2:

_____

_____ [4]

5

[Turn over

3 **Fig. 2** shows a cam and follower.

Fig. 2

(i) Select a word from the list below to describe the motion of the follower.

Reciprocating   **Linear**   **Rotary**   **Oscillating**

_____ [1]

(ii) Which component produces the output motion?

_____ [1]

(iii) Select the correct name for the cam from the following.

Eccentric   **Heart shaped**   **Pear shaped**

_____ [1]

(iv) The cam turns until the point **A** is in contact with the follower. Determine the direction and distance moved by the follower.

_____

_____ [2]

4 **Fig. 3** shows a plastic holder for leaflets in a library. The holder is attached to a wooden notice board using screws which pass through the inserts.
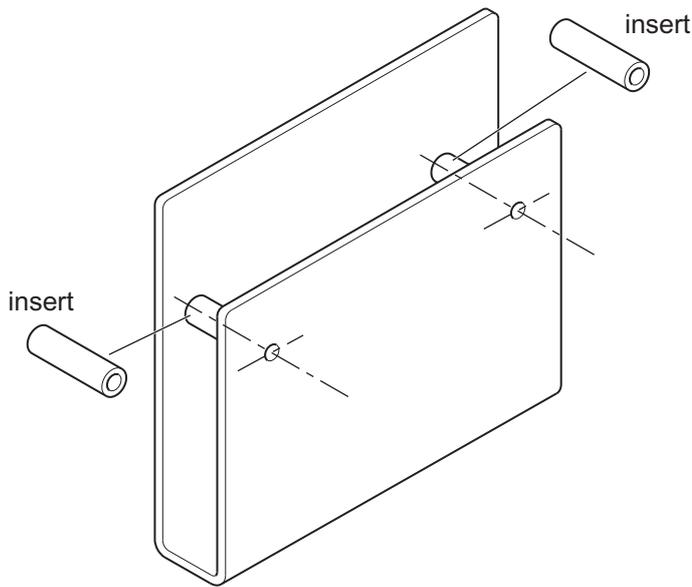
Fig. 3

(i) State **one** specification point which should be considered in designing the leaflet holder.

_____ [1]

(ii) Suggest a suitable plastic material for the holder and give **one** reason for your choice.

Material _____

Reason _____ [2]

(iii) **What equipment** would be used to bend the material into the shape illustrated in **Fig. 3**?

_____

_____ [2]

(iv) Give **one** reason for using inserts as shown in **Fig. 3**.

Reason _____ [2]

6487   **7**   **[Turn over**

5 **(a)** **Table 2** shows five electronic circuit symbols. Name the four remaining electronic circuit symbols in **Table 2** below.

Table 2

⊗	⊢K	⊘	▯	⊘
BULB				

[4]

(b) Insert **all five** symbols, shown in **Table 2**, into the part completed circuit diagram (**Fig. 4**) illustrated below. When the diagram is complete the bulb should switch on when there is a change in temperature.
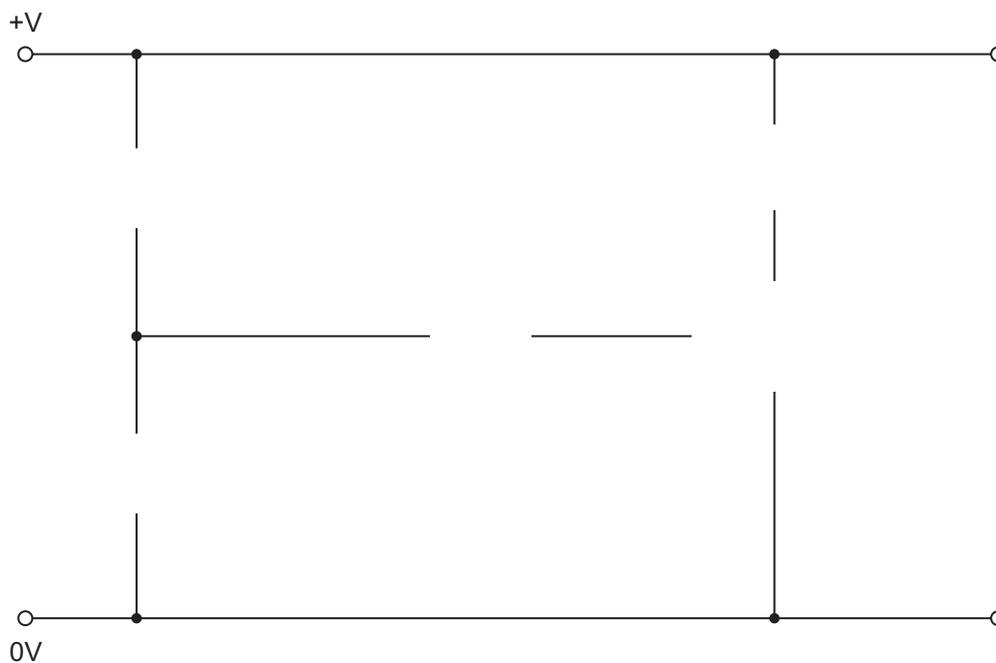
+V

0V

Fig. 4

[5]

8

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(Questions continue overleaf)

6 **(a)** **Table 3** shows the symbols for methods of operation of valves.

Table 3

Symbol	Name of symbol

Complete **Table 3** by inserting the correct name for each symbol from **Table 4**.

Table 4

Plunger
Roller trip
Lever
Push button

[4]

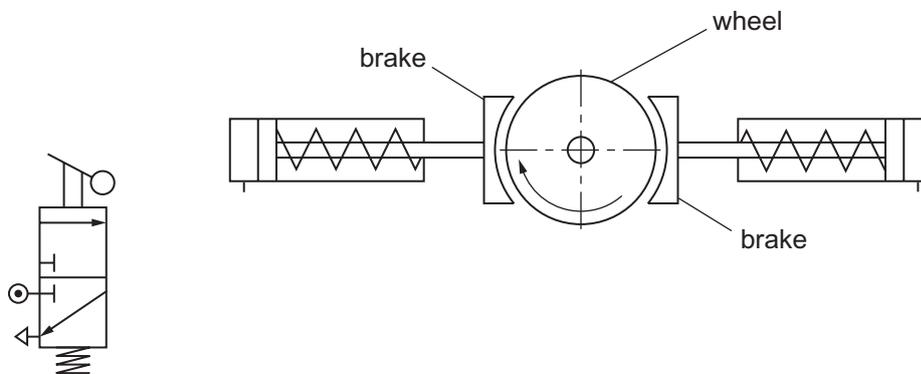**(b)** **Fig. 5** shows part of a pneumatic circuit which is used to apply brakes to a wheel.

Fig. 5

Complete **Fig. 5** to show how the brakes could be applied. [3]

6487

10

7 **Fig. 6** shows a drawing of a metal component for a school project. The component part is to be made from brass sheet 2 mm thick.
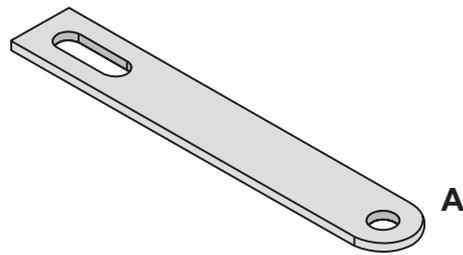
Fig. 6

(i) Is brass a ferrous or non-ferrous metal?

_____ [1]

(ii) Why are alloys of metals formed?

_____

_____ [2]

(iii) Name the tool used to mark the centre of the hole in the metal component at end **A** to help drilling.
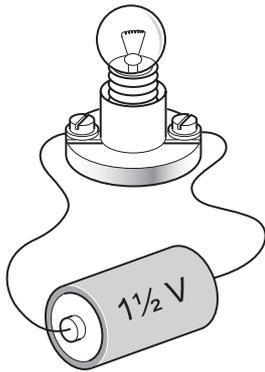
_____ [2]

(iv) Suggest a suitable finish that could be applied to the metal component.

_____ [1]

8 **(a)** Two basic circuit drawings are shown in **Fig. 7** and **Fig. 8** below.

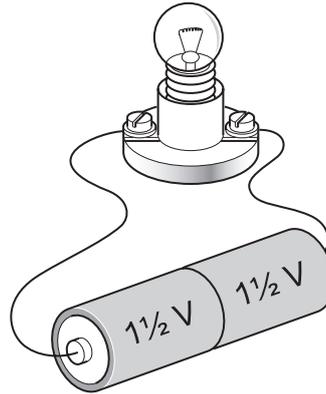**Fig. 7**   **Fig. 8**
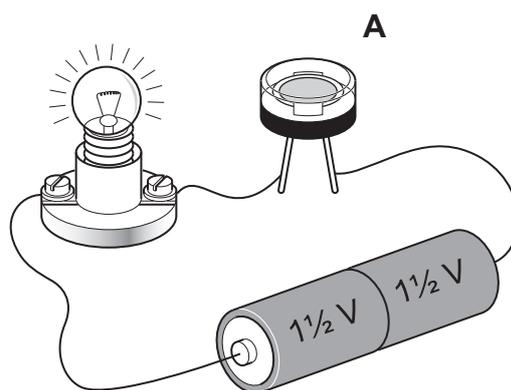
(i) Which circuit bulb would you expect to glow brighter?

_____ [1]

(ii) Explain your answer.

_____

_____ [2]

(b) **Fig. 9** shows a slightly modified version of the circuit shown in **Fig. 8**.

A

Fig. 9

Examiner Only	
Marks	**Remark**

6487   **12**

(i) Name the component labelled **A** in **Fig. 9**.

Component **A** _____ [1]

(ii) Explain how this component works in this electronic circuit.

_____

_____ [2]

(iii) Suggest **one** possible use for this electronic circuit.

_____ [1]

(iv) Draw a circuit diagram for **Fig. 9** in the space below. Label each electronic symbol used in your circuit.

[5]

6487   **13**   **[Turn over**

9 **(a)** **Fig. 10** shows the head of a robot. The eyes of the robot are to be controlled by two electric motors A and B.

When the sensor in the nose of the robot is covered, both eyes rotate in a clockwise direction for 4 seconds. The program then stops.
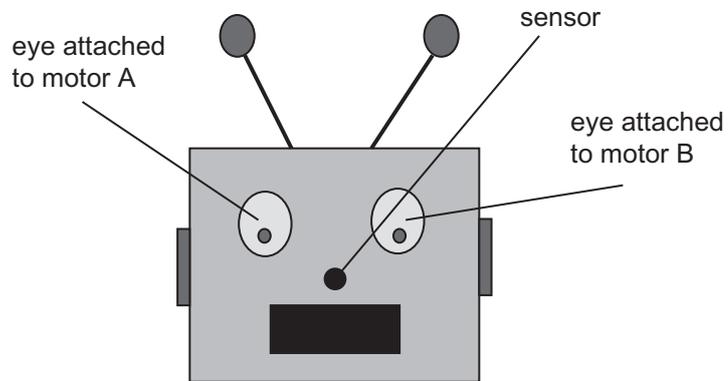

eye attached to motor A

sensor

eye attached to motor B

Fig. 10

Complete the flowchart in **Fig. 11** to show the process. [4]

START

Is the sensor covered?

No

Yes

Fig. 11

14

(b) The program in question **9 (a)** is to be changed so that when the sensor is covered motor A comes on for 3 seconds.

Then motor B comes on to rotate the other eye for 3 seconds. The program then stops.

Complete the flowchart in **Fig. 12** to show this process. [7]

START

Fig. 12

15

[Turn over

10 (a) Fig. 13 shows a bracket which is used to support a hanging basket.
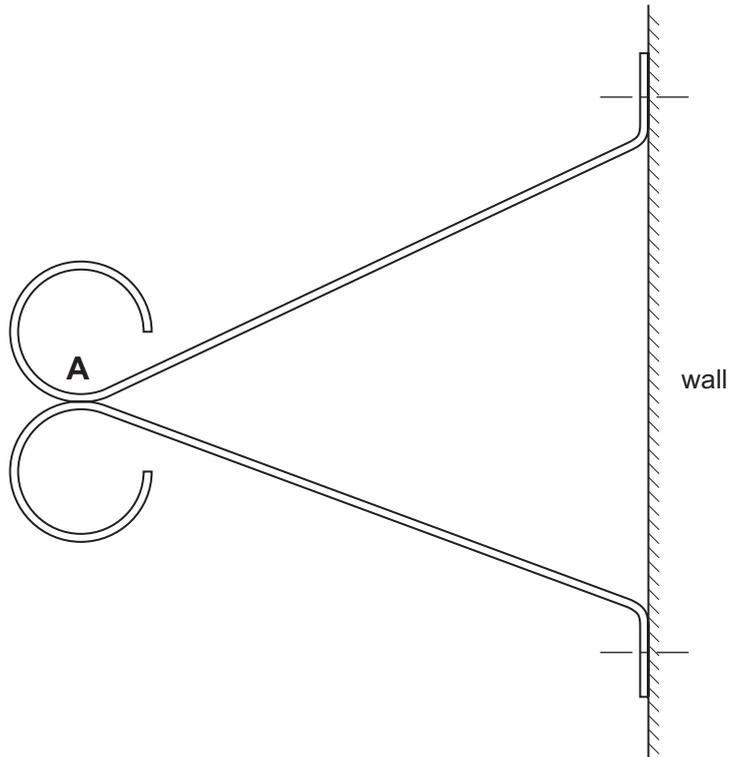
Fig. 13

(i) Name a suitable material for the bracket.

_____ [1]

(ii) Suggest a suitable finish for the bracket.

_____ [1]

(iii) State a suitable permanent method for joining the two parts at **A**.

_____ [1]

(iv) Give **one** reason why a semi-permanent method may not be suitable for joining the parts at **A**.

_____ [2]

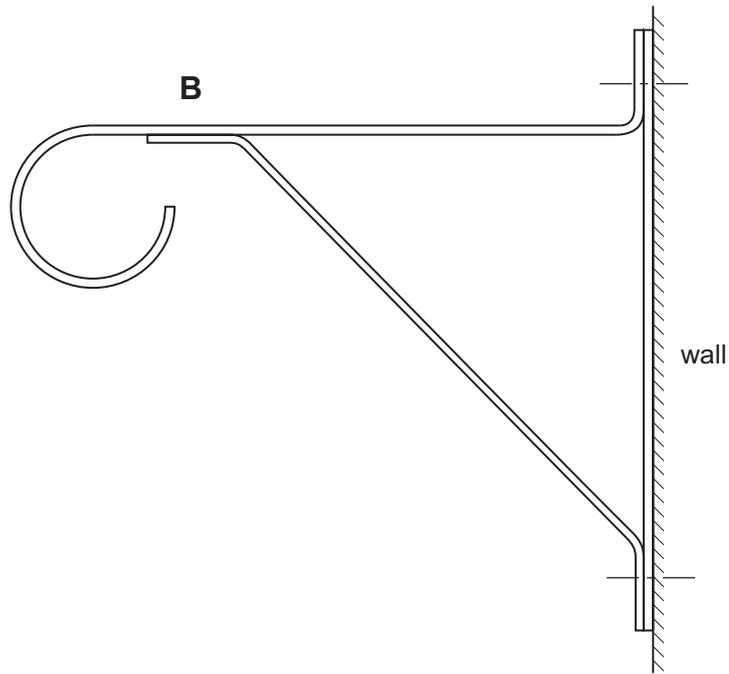**(b) Fig. 14** shows a different design for the bracket.

B

wall

Fig. 14

(i) State a semi-permanent method for joining the parts at **B**.

_____ [1]

(ii) Explain why a semi-permanent method may be suitable for joining the parts at **B**.

_____ [1]

[Turn over

11 Pneumatic systems use the energy stored in compressed air to do the work. By controlling the supply of the air to pneumatic cylinders, movement can be produced. Describe how you would construct a pneumatic circuit using a platform and discrete components. In your answer make reference to the attachment of the components to the platform, the connection of the piping and the testing of the circuit. Include any specific safety precautions for this process.

[10]

THIS IS THE END OF THE QUESTION PAPER

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