Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017

Technology and Design

Unit 1:

Technology and Design Core

GTD11

[GTD11]

TUESDAY 23 MAY, MORNING

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.

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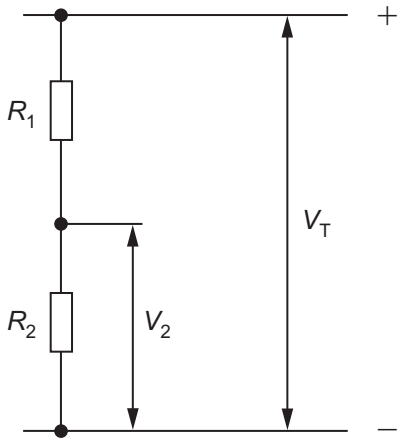
Formulae for GCSE Technology and Design

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 $R_T = R_1 + R_2 + R_3$ *etc.*

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

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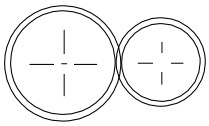
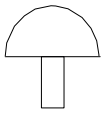
1 **Table 1** shows a number of different symbols. Using the first row as a guide, complete the table.

Table 1

Sketch of Symbol	Type of Symbol	Name of Symbol
	Electronic	Bulb
		Push to Make Switch
		
	Electronic	
	Hazard Sign	
	Flow Chart	Decision
		

[9]

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2 An understanding of the processes of computer aided design (CAD), computer aided manufacture (CAM) and computer numerical control (CNC) are essential for manufacturing companies. **Fig. 1** shows a typical CNC workshop.

© kadmy / iStock / Thinkstock

Fig. 1

(a) What is the function of a 'computer file' in a CNC machine?

_____

_____

_____ [2]

(b) Give **two** examples of how CAM helps the manufacturing process.

1. _____

_____

_____

2. _____

_____

_____ [2]

[Turn over

3 **Fig. 2** shows three types of cam.

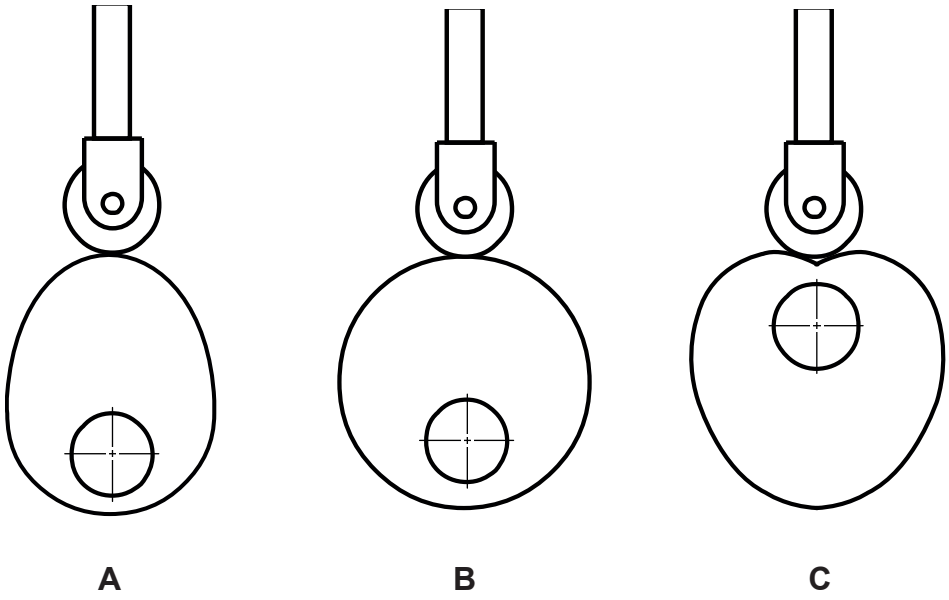


Fig. 2

(i) State the correct name for each of the cams labelled **A**, **B** and **C** in **Fig. 2**.

A _____

B _____

C _____ [3]

(ii) Name the type of follower shown in **Fig. 2**.

_____ [1]

(iii) State the type of input motion required to operate cam **A** in **Fig. 2** and the type of output motion produced.

Input motion _____

Output motion _____ [2]

4 **Table 2** shows a number of methods for joining materials.

Complete **Table 2** by:

- Stating the appropriate type of material for which each method is used.
- Stating if the method is permanent or semi-permanent.

The first example has been completed.

Table 2

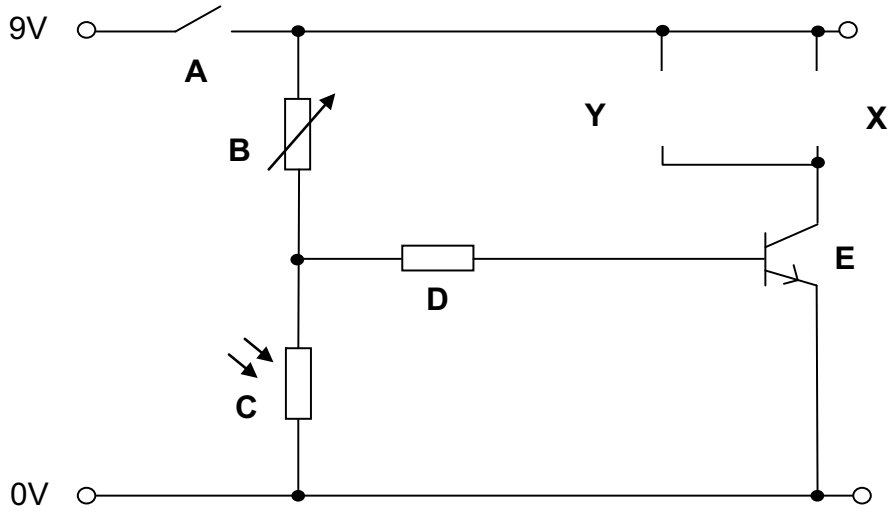
Method of joining	**Type of material joined**	**Permanent or Semi-permanent**
Welding	Metal	Permanent
Tensol (Solvent) cement		
Wire nails		
Dowels		

[6]

[Turn over

5 An electronic circuit designed to switch on an electric motor under certain conditions is shown in **Fig. 3** below. The motor and a diode, which are necessary to complete the circuit, need to be inserted at points **X** and **Y**.

(a) Complete the circuit by correctly inserting the electronic symbol for the motor at point **X** and the electronic symbol for the diode at point **Y**.



[3]

Fig. 3

(b) Name each of the electronic components shown by the symbols labelled **A, B, C, D** and **E** in **Fig. 3** above.

Component **A** _____

Component **B** _____

Component **C** _____

Component **D** _____

Component **E** _____ [5]

(c) (i) What effect does component **C** have in the operation of this circuit?

_____

_____ [2]

(ii) What is the purpose of the diode in this circuit?

_____

_____ [2]

[Turn over

6 **(a)** Pneumatic circuits use a number of methods to operate valves.

Table 3 shows the symbols for two methods of operation of valves.

Table 3

Symbol	Name of Symbol
	
	

[2]

(i) Complete **Table 3** by inserting the correct name for each symbol.

(ii) Which of the two methods of operation would be used for a valve located at the outstroke of a cylinder?

_____ [1]

(b) **Fig. 4** shows a pneumatic circuit which could be used for clamping work.

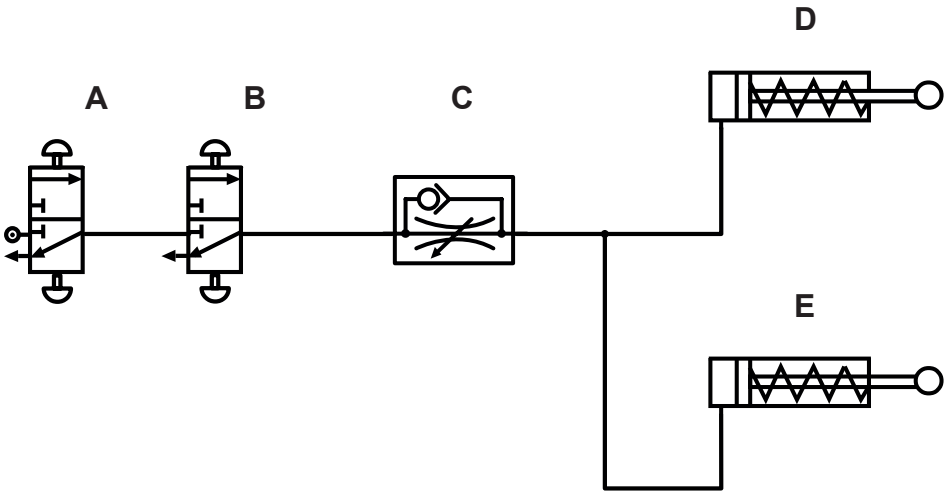


Fig. 4

(i) Name the component **C**.

_____ [1]

(ii) State the function of **C** in the circuit.

_____ [1]

(iii) State the operation of cylinders **D** and **E** when:

- Valves **A** and **B** are both operated.

_____ [1]

- Valve **B** is then reset.

_____ [2]

[Turn over

7 **Fig. 5** shows a sketch of a hanging wind chime to be made from beech wood, aluminium alloy tubes and brass. The chime makes sounds when the wind blows.

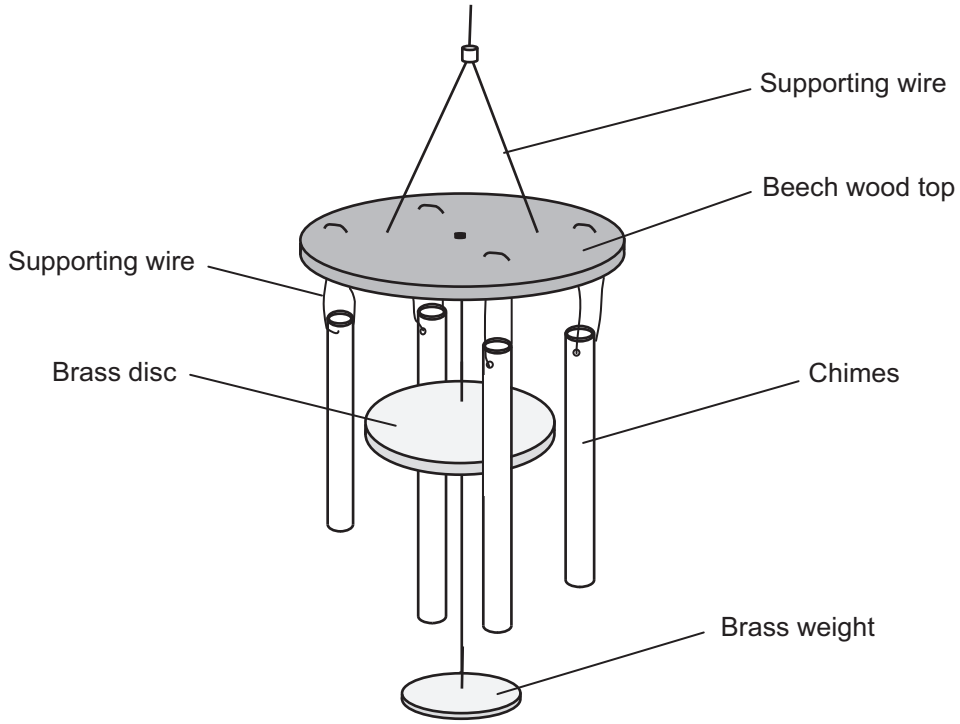


Fig. 5

(a) Aluminium alloy tubes are used for the chimes.

(i) Explain the term alloy.

_____

_____ [2]

(ii) Is aluminium alloy a ferrous or non-ferrous metal?

_____ [1]

(iii) Name an appropriate hand tool that could be used to cut the aluminium tubes.

_____ [1]

(iv) Name an appropriate school workshop machine that could be used to polish the aluminium tubes.

_____ [1]

(b) **(i)** Name a tool or machine that could be used to cut the circular wooden beech top.

_____ [1]

(ii) Is beech a hardwood or a softwood?

_____ [1]

[Turn over

8 **Fig. 6** shows a basic circuit that requires a thermistor symbol to be inserted at **A**.

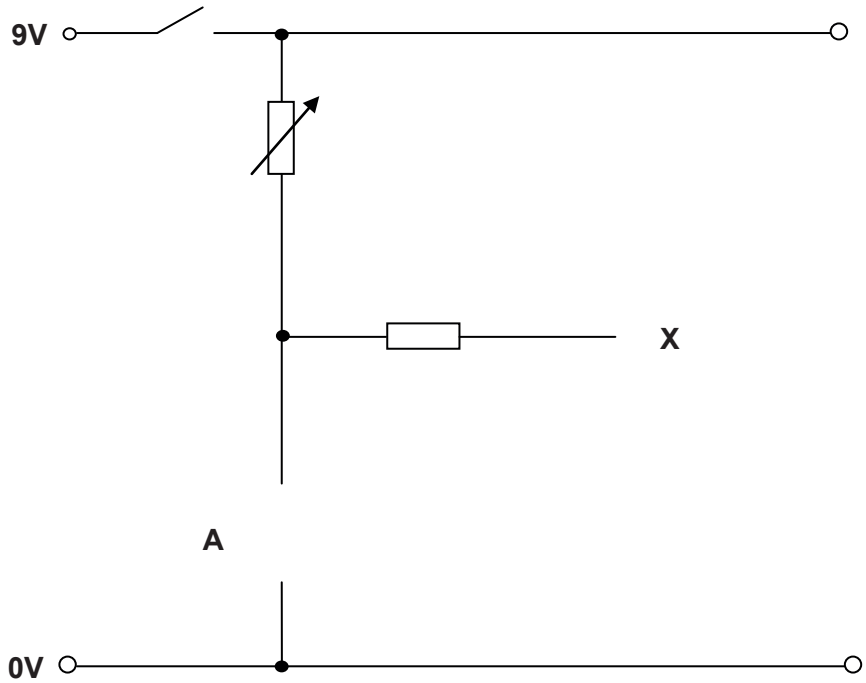


Fig. 6

(a) (i) Complete the circuit diagram by inserting the symbol for a thermistor at **A**. [1]

(ii) Explain how an output voltage can be obtained at point **X** when the thermistor has been added to the circuit.

_____

_____

_____

_____ [3]

(iii) Name the type of circuit shown in **Fig. 6** above.

_____ [1]

(b) The circuit is to be developed to enable an LED to be operated.

Complete the circuit in **Fig. 6** using a thyristor to operate the LED. [6]

9 **Fig. 7** shows a coffee vending machine. The machine provides a plastic cup and coffee, with an option to supply milk.

Fig. 7

The program to operate the coffee vending machine starts when a customer inserts a one pound coin into a slot on the machine. A plastic cup drops down onto a shelf. A valve opens for four seconds and delivers a set amount of coffee. A customer is required to press a “YES” or “NO” button in response to a “MILK REQUIRED” message which appears on the machine. If milk is required, a milk valve opens for two seconds. The machine then waits for a new customer. If no milk is required the machine waits for a new customer.

Complete the flow chart in **Fig. 8** to illustrate the program to run the coffee vending machine.

Fig. 8

[12]

[Turn over

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10 **Fig. 9** shows an extension cable reel.

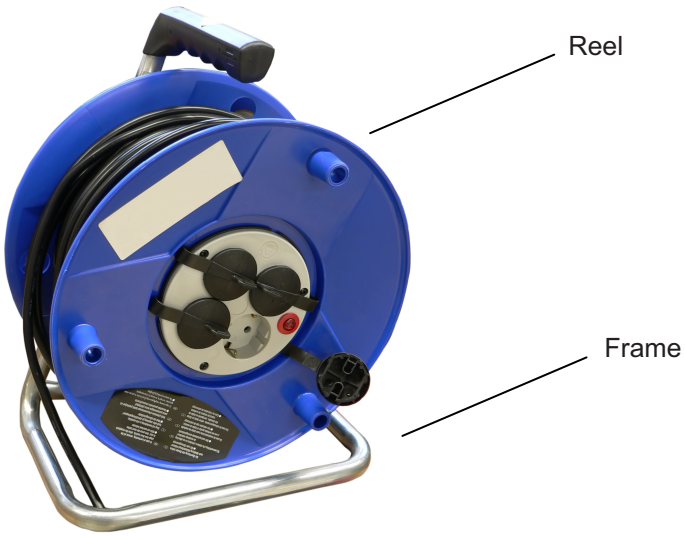

Fig. 9

(a) The frame on which the reel is mounted is made from round steel tube.

Give **two** reasons why round steel tube is more suitable than square steel tube for the frame.

1. _____

_____

2. _____

_____ [2]

(b) State **three** design criteria which should be considered in relation to the reel of the extension cable.

1. _____

2. _____

3. _____ [3]

[Turn over

11 A mild steel "L" shaped bracket is to be made from flat steel bar in a school workshop as part of a project to support a shelf. The flat steel bar measures 240 mm long, 25 mm wide and 4 mm thick.
Four countersunk, 8 mm diameter holes are required to locate fixing screws. The holes should be positioned along the centre line of the bar. Two of the holes are drilled at distances of 40 mm and 80 mm from one end of the bar. The other two holes are drilled at 40 mm and 80 mm from the opposite end of the bar.
The bracket should be completed by bending it at a right angle (90 degrees), midway along the length of the bar.

Describe the process of making the mild steel bracket to include: marking out; drilling and bending of the flat mild steel bar.

Make reference to any appropriate tools, machines, equipment and safety precautions used in this process.

Quality of written communication will be assessed in this question.

[10]

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

Examiner Number