



Rewarding Learning

General Certificate of Secondary Education
2023

Centre Number

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Candidate Number

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Technology and Design

Unit 1:

Technology and
Design Core Content

MV18

[GTY11]

WEDNESDAY 14 JUNE, MORNING

Time

1 hour 30 minutes, 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.

Answer **all ten** questions.

Information for Candidates

The total mark for this paper is 100.

Quality of written communication will be assessed in Question **10**.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

The Formula sheet is on page 3.

Blank Page

(Questions start 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 \times resistance ($V = I \times R$)

2 Series Resistors $R_t = R_1 + R_2 + \dots + R_n$

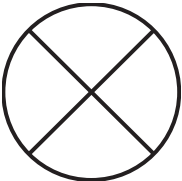


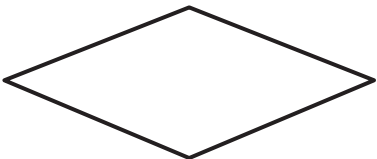
3 Gear ratio of a simple gear train = $\frac{\text{number of teeth on driven gear}}{\text{number of teeth on driver gear}}$

4 Velocity ratio = $\frac{\text{diameter of driven}}{\text{diameter of driver}}$

1 **Table 1** refers to a number of symbols.

(a) Using the first row as a guide, complete the table.
[8 marks]

Table 1

Sketch of Symbol	Type of Symbol	Name of Symbol
	Electronic	Bulb
		Thermistor
	Mechanical	Lever
	Hazard	
		
		

(b) The formula for Ohm's law can be written or expressed in different ways.

For example if we want to find the value of **V** it is expressed as $V = I \times R$.

(i) Complete the formula below to show how the value of **R** can be found. [1 mark]

R =

(ii) State what **V**, **I** and **R** represent in the Ohm's law formula. [1 mark for each]

V _____

I _____

R _____

2 Vacuum forming is a common workshop process using plastics. Two plastics are named below:

- Urea formaldehyde
- Polyvinyl chloride

(a) Select the most suitable plastic for vacuum forming, giving a reason for your answer. [1 mark]

Reason [2 marks] _____

(b) Describe **four** sequential key stages in the vacuum forming process. [1 mark for each]

1. _____

2. _____

3. _____

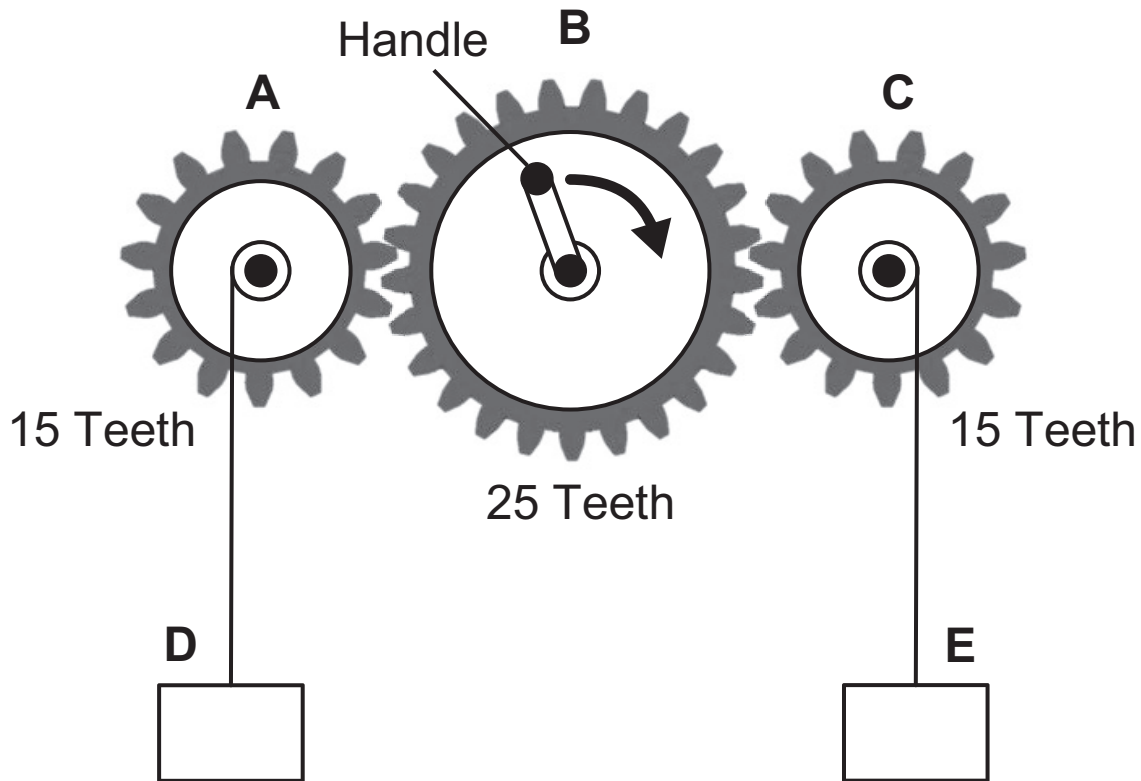
4. _____

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(Questions continue overleaf)

- 3 **Fig. 1** shows a gear train used in a toy crane. The loads **D** and **E** are raised and lowered by cords wound on pulleys attached to the gears **A** and **C**. The gear **B** can be rotated by a handle as shown.

Fig. 1



- (i) The handle on **B** is rotated clockwise as shown.

Mark on **Fig. 1**: [4 marks]

- The direction of rotation of gears **A** and **C**; and
- The direction of movement of loads **D** and **E**.

(ii) Wheel **B** is rotated at 30 rev/min.


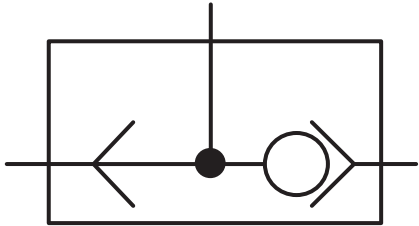
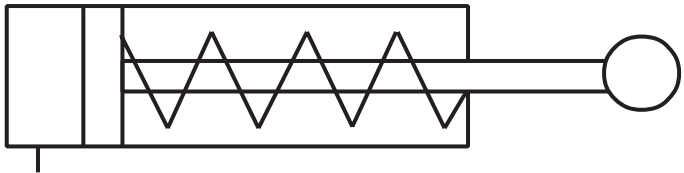
Calculate the speed of rotation of wheels **A** and **C**.

Candidates need to show their working out in the space below. [3 marks]

Answer _____

4 **Table 2** shows a number of pneumatic symbols.

Table 2

Pneumatic Symbol	Name of Symbol
	
	
	

(a) Complete **Table 2** by selecting the correct name for each symbol from **Table 3**. [3 marks]

Table 3

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

(b) (i) Name the pneumatic component represented by each of the symbols **A** and **B** shown below.
[2 marks]



A



B

A _____

B _____

(ii) Explain how each component is operated and how it controls a circuit. [2 marks for each]

A _____

B _____

5 (a) Place a tick (✓) in the correct box to respond to each of the following questions. [5 marks]

- Copper is:

a good conductor of heat

a good insulator of heat

- A marking knife is:

used to mark lines on metal

used to mark lines on wood

- Chipboard is:

a manufactured board

a naturally occurring material

- Steel is hardened by:

heating to cherry red and quenching
in cold water

heating to cherry red and cooling
slowly in air

- Melamine is:

a thermosetting plastic

a thermoplastic

(b) Wasting and joining are two production methods or processes used on materials such as wood, metal and plastic.

Outline the difference between the wasting and joining processes. [2 marks]

Give **two** examples of a wasting process that can be applied to a metal. [2 marks]

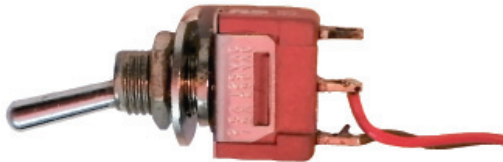
Example 1 _____

Example 2 _____

- 6 **Fig. 2** shows three electronic components used to produce a basic circuit.
The components are labelled **A**, **B** and **C**.

Fig. 2

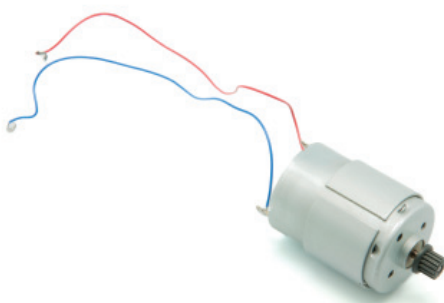
A



B



C



- (a) (i) Name the three components. [3 marks]

Component **A** _____

Component **B** _____

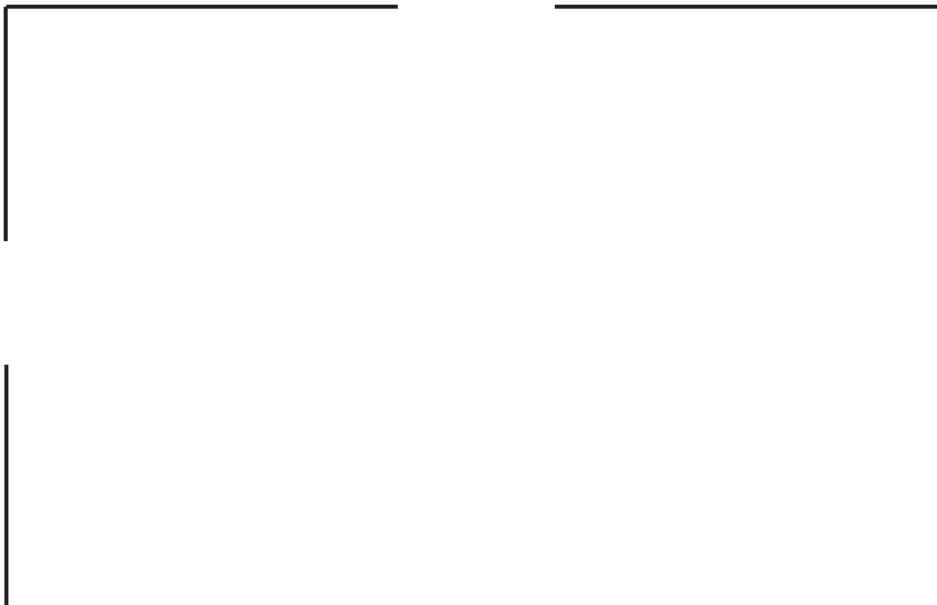
Component **C** _____

(ii) Which component provides the output from the circuit? [1 mark]

(iii) How is the output controlled in this circuit? [1 mark]

(b) Complete the circuit diagram shown in **Fig. 3** below by inserting the correct electronic symbols for the components **A**, **B**, and **C** shown in **Fig. 2**. [3 marks]

Fig. 3



(c) It was decided to replace component **C** with the component shown in **Fig. 4**.

Fig. 4



(i) Name the component shown. [1 mark]

(ii) The component shown in **Fig. 4** requires a protective resistor.

If the protective resistor has a value of $390\ \Omega$, use the information below to work out the colour bands of this 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

Colour Band 1 _____

Colour Band 2 _____

Colour Band 3 _____

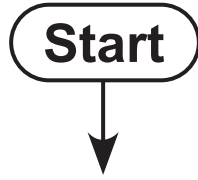
- 7 **Fig. 5** shows a house which has an alarm system fitted. When the alarm system is set it will operate a buzzer and an LED on the alarm box if an outside door is opened. This will happen 30 seconds after an outside door is opened. The buzzer and the LED will continue to operate unless the alarm system is reset.

Fig. 5



Complete the flow chart in **Fig. 6** to illustrate the program to run the alarm system. [11 marks]

Fig. 6



8 Two steel plates could be permanently joined together either by brazing, soft soldering or welding.

(a) Put the three joining processes in order, based on the joining temperature required. Start with the highest temperature first. [1 mark for each]

1. _____
2. _____
3. _____

(b) Outline **four** stages in the process of soft soldering. [1 mark for each]

1. _____
2. _____
3. _____
4. _____

(c) Two semi-permanent joining processes for metals are:

- using nuts and bolts; and
- using machine screws.

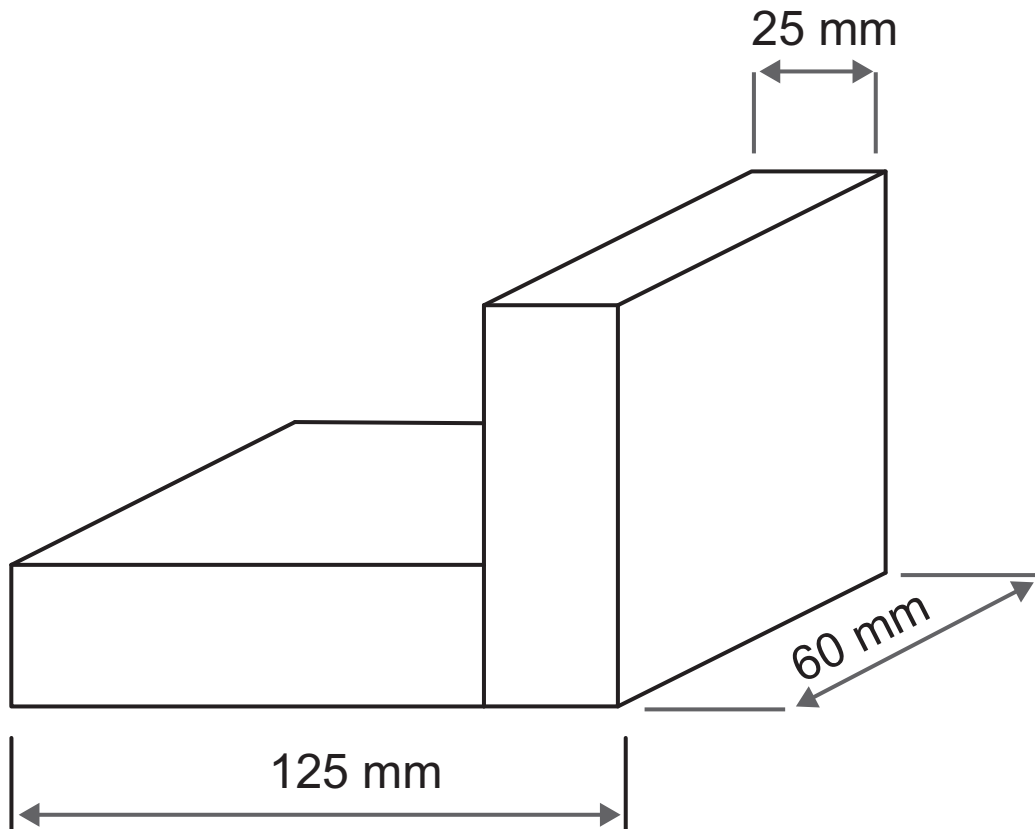
(i) Outline the difference between the two semi-permanent methods of joining. [2 marks]

- (ii) Select the most appropriate semi-permanent method, from the two given, to join the two metal plates shown in **Fig. 7**. Give a reason for your choice. [2 marks]

Method _____

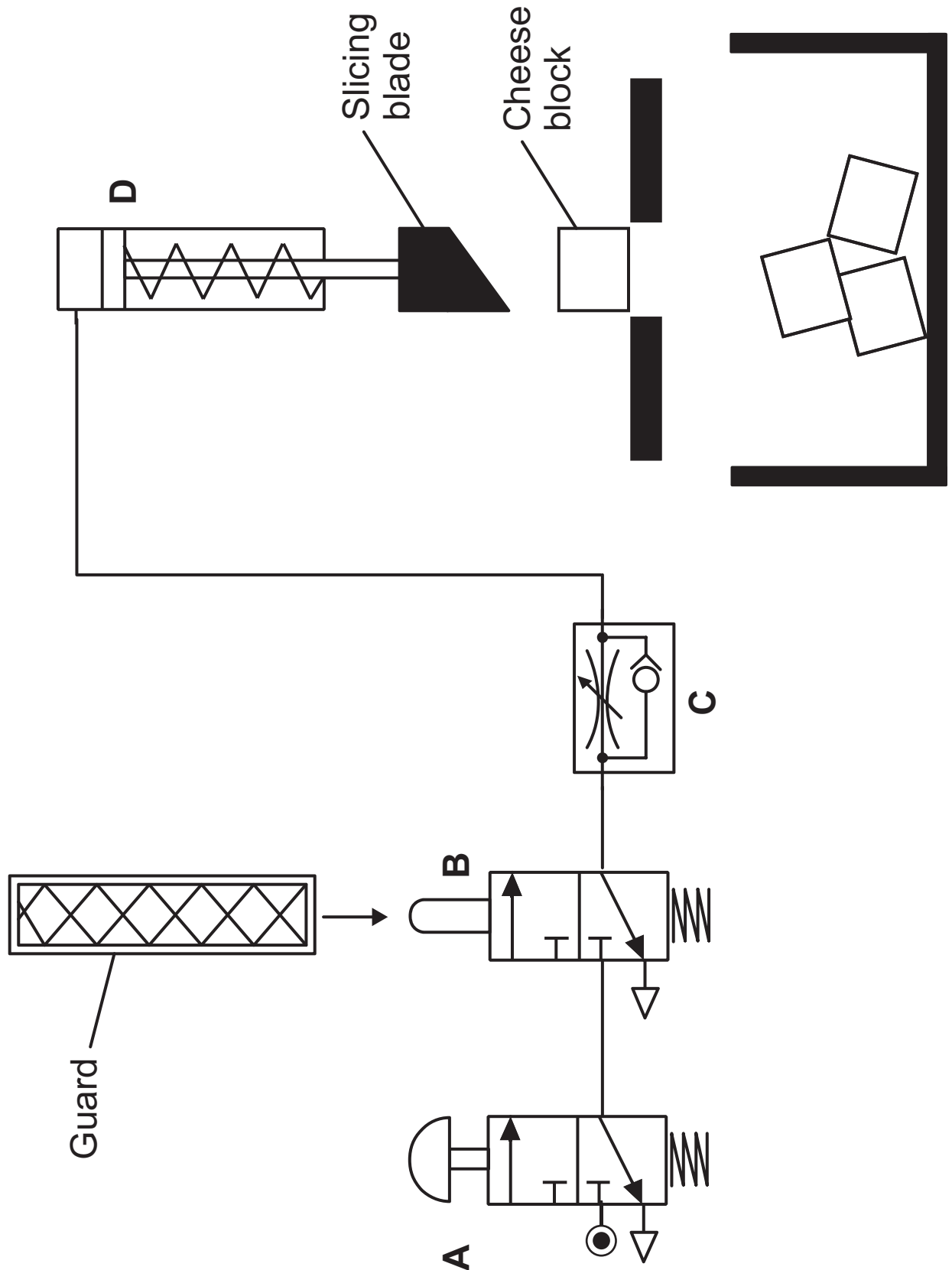
Reason _____

Fig. 7



- 9 (a) Fig. 8 shows a pneumatic circuit for slicing a large block of cheese.

Fig. 8



- (i) Four pneumatic components in **Fig. 8** are lettered. Complete **Table 4** by inserting the letter **A**, **B**, **C** or **D** to represent each component listed. [4 marks]

Table 4

Pneumatic Component	Letter
Unidirectional Flow Restrictor	
3/2 Valve Plunger Operated	
Single Acting Cylinder	
3/2 Valve Push Button Operated	

- (ii) Explain how component **D** is operated to slice the cheese block. [2 marks]

(iii) During slicing it was found that the shape of the cheese block was being disfigured due to the blade cutting too slowly.

Explain how this problem could be overcome.
[2 marks]

(iv) The circuit uses two components in a logic combination to activate the circuit. Identify the logic sequence. [1 mark]

(b) (i) Suggest a material that would be used in the production of the slicing blade. [1 mark]

(ii) Giving **two** reasons, explain why the material you have chosen would be suitable for the slicing blade.
[2 marks]

SOURCES

Table 1, Hazard symbol.....© Getty Images

Fig.2, Image A © Chief Examiner

Fig.2, image B © Getty Images

Fig.2, image C © Chief Examiner

Fig.5 . . . © Getty Images

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

Total Marks	
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Examiner Number

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