



Centre Number

71

Candidate Number

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General Certificate of Secondary Education  
2014

## Technology and Design

Unit 1: Technology and  
Design Core

[GTD11]

FRIDAY 23 MAY, AFTERNOON

MV18

### 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.

Write your answers in the spaces provided in this question paper.

Questions which require drawing or sketching should be completed using an HB pencil. All other questions must be completed in blue or black ink.

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.

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**(Questions start on page 4)**

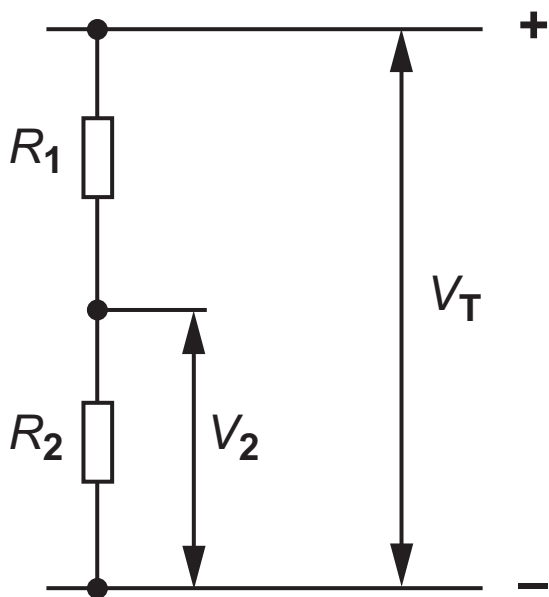
## Formulae for GCSE Technology and Design

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 For potential divider

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





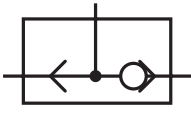


3 Series Resistors  $R_T = R_1 + R_2 + R_3$  etc

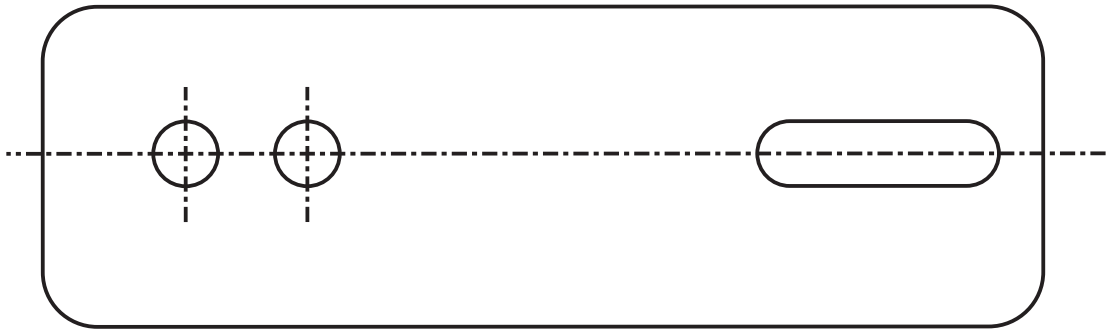
4 Gear ratio of a simple gear train =  $\frac{\text{number of teeth on driven gear}}{\text{number of teeth on driver gear}}$

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
	Electronic	Variable resistor
	Mechanical	
		
	Hazard	
		Light dependent resistor
		

2 **Fig. 1** shows an aluminium bracket which a company is going to produce using a computer aided manufacturing process.



**Fig. 1**

(a) There are two general stages in the computer aided manufacturing (CAM) process:

- Generation of a file
- Manufacturing the product

(i) How is a file generated? [1 mark]

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(ii) What CAM process is used to manufacture the product? [1 mark]

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(b) Give **one** advantage and **one** disadvantage of using a CAM process compared to a manufacturing process that does not use CAM. [2 marks]

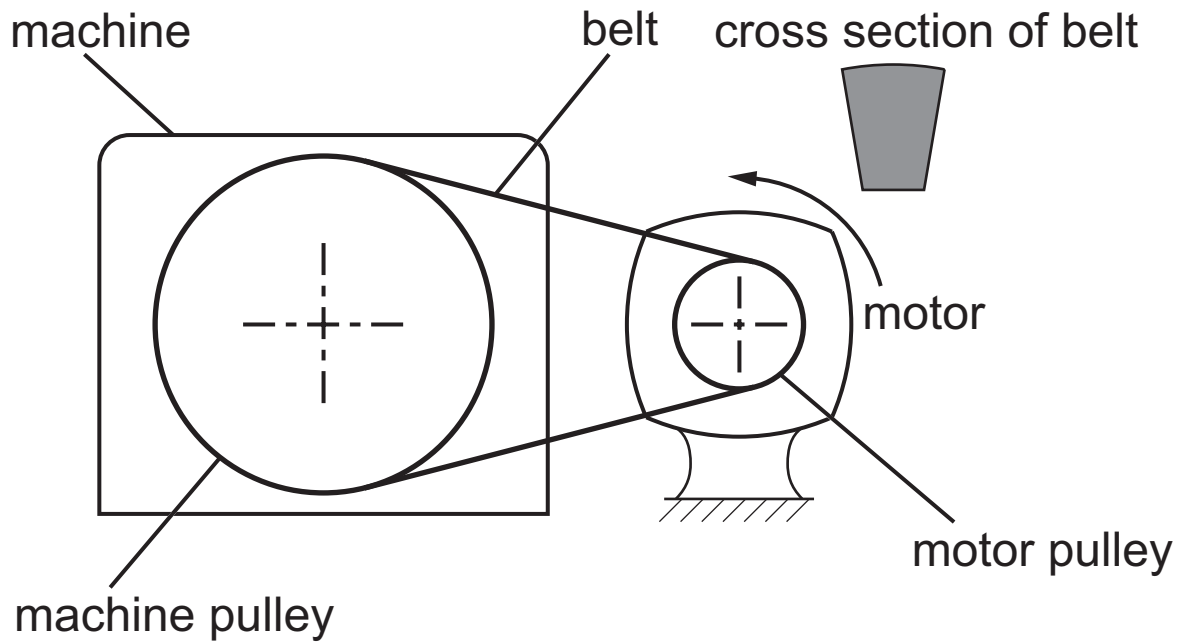
Advantage: \_\_\_\_\_

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Disadvantage: \_\_\_\_\_

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- 3 **Fig. 2** shows a belt and pulley system which is used to transmit power from a motor to a machine pulley.



**Fig. 2**

- (i) Name the type of belt shown. [1 mark]

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- (ii) State the type of motion at the machine pulley. [1 mark]

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- (iii) Name **one** other method which could be used to transmit power from the motor to the machine. [1 mark]

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- (iv) Mark on **Fig. 2** the direction of motion of the machine pulley. [1 mark]

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(v) Suggest how the system could be modified to give a slower output speed for the same motor speed.  
[2 marks]

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4 Plastics can be separated into two main types: thermoplastic and thermosetting.

(i) Outline the main difference between the two types of plastic. [2 marks]

Thermoplastic \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Thermosetting \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(ii) **Table 2** shows a list of plastic materials.

Complete **Table 2** by inserting a tick (✓) in the appropriate column to show if the material is thermosetting or thermoplastic. [4 marks]

**Table 2**

Material	Thermosetting	Thermoplastic
Acrylic		
Melamine		
Polyester resin		
Rigid polystyrene		



**(iii)** Which **one** of the materials in **Table 2** would be suitable for a kitchen worktop surface?

Give a reason for your choice. [2 marks]

Material \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

- 5 The symbols for **two** electronic components are shown in **Fig. 3** below.



**Fig. 3**

- (a) (i) Name each of the electronic symbols shown in **Fig. 3**. [2 marks]

Symbol **A** \_\_\_\_\_

Symbol **B** \_\_\_\_\_

- (ii) Label or mark on either symbol an **X** to show the input leg of the component. [1 mark]

- (iii) For the component symbol that you have selected name the input leg. [1 mark]

\_\_\_\_\_

- (iv) Component **A** requires a minimum input voltage to operate. The voltage required falls within one of the three voltage ranges shown below.

Select the voltage range in which the input leg will operate. [1 mark]

0.1 V – 0.3 V

0.35 V – 0.55 V

0.6 V – 0.8 V

\_\_\_\_\_

- (b) (i)** Both components are used as electronic switches. Outline the switching operation of each component. [4 marks]

Component **A** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Component **B** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (ii)** A protective resistor is generally used with either component. Redraw either component to include its protective resistor. [2 marks]

6 (a) Name each of the following pneumatic symbols:

(i)  \_\_\_\_\_ [1 mark]

(ii)  \_\_\_\_\_ [1 mark]

(iii)  \_\_\_\_\_ [1 mark]

(b) Fig. 4 shows a pneumatic circuit which operates a press.

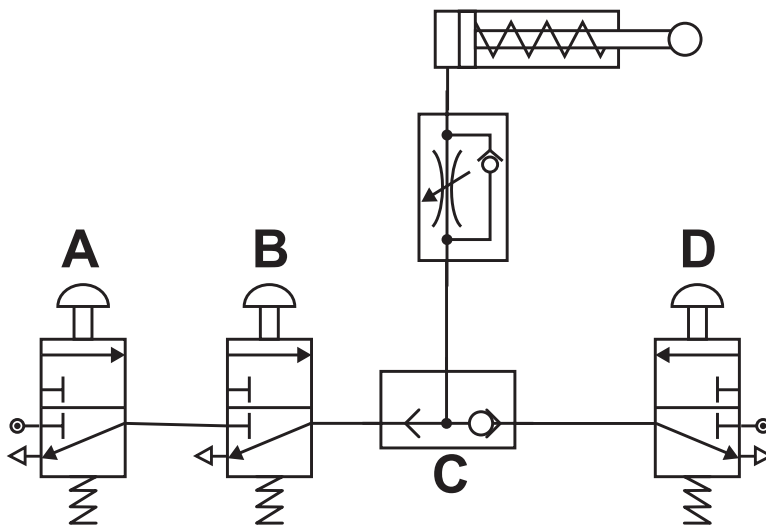


Fig. 4

(i) State the type of logic connection for valves A and B. [1 mark]

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(ii) Suggest a reason for using this type of connection. [1 mark]

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(iii) State the **two** methods which could be used to operate the cylinder. [2 marks]

Method 1 \_\_\_\_\_

Method 2 \_\_\_\_\_

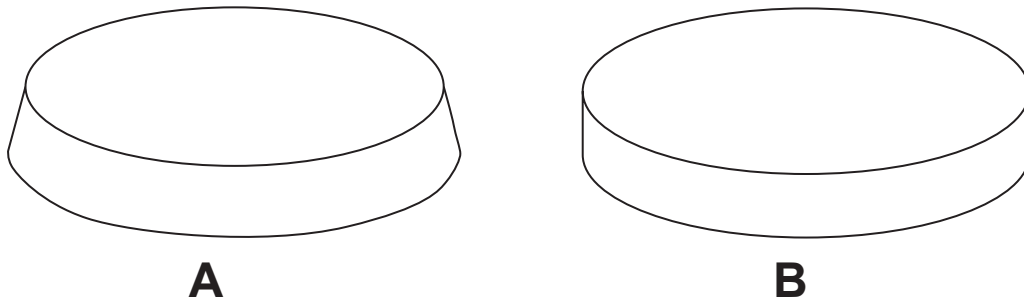
(iv) Explain why valve **C** is necessary in the circuit. [2 marks]

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7 **Fig. 5 A and B** show sketches of two possible moulds to be used in a vacuum forming process.



**Fig. 5**

**(a)** Explain why mould **A** was selected in preference to mould **B**. [1 mark]

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**(b)** MDF was used to manufacture the mould in preference to mahogany.

**(i)** What does MDF stand for? [1 mark]

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**(ii)** Other than cost, why would MDF be used in preference to mahogany? [1 mark]

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(c) When mould **A** was used for vacuum forming there was difficulty removing it from the formed plastic.

Suggest **two** changes or improvements to the mould to overcome this problem.

Change 1 [1 mark] \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Change 2 [1 mark] \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8 (a) Name **three** tools or items of equipment that may be used when constructing an electronic circuit on a printed circuit board. [3 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

(b) A list of electronic components is shown below. Select the six components required, in addition to a buzzer, to build a circuit that would operate a buzzer when the temperature is high. The circuit should include a potential divider. [6 marks]

Use a tick (✓) to show your choice of six components.

List of electronic components

Variable resistor

Diode

LED

Bulb

Motor

Transistor

Thermistor

Resistor

LDR

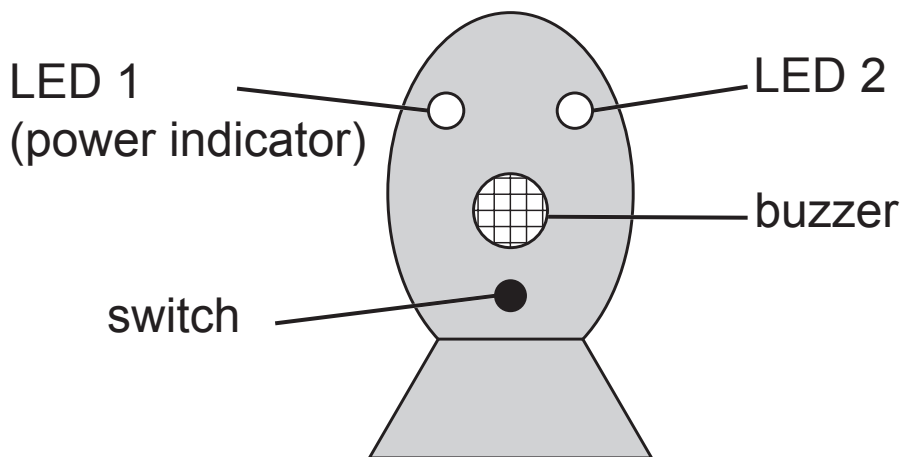
SPST switch

Battery



(c) In the space below produce a neat diagram of the potential divider part of the circuit needed to operate the buzzer. [2 marks]

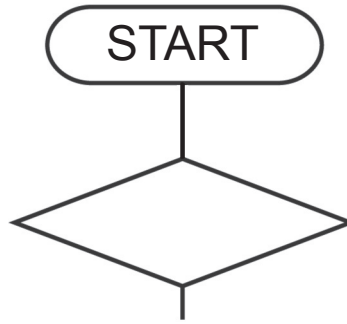
9 **Fig. 6** shows a sketch of an egg timer which is programmed to operate in a specific sequence.



**Fig. 6**

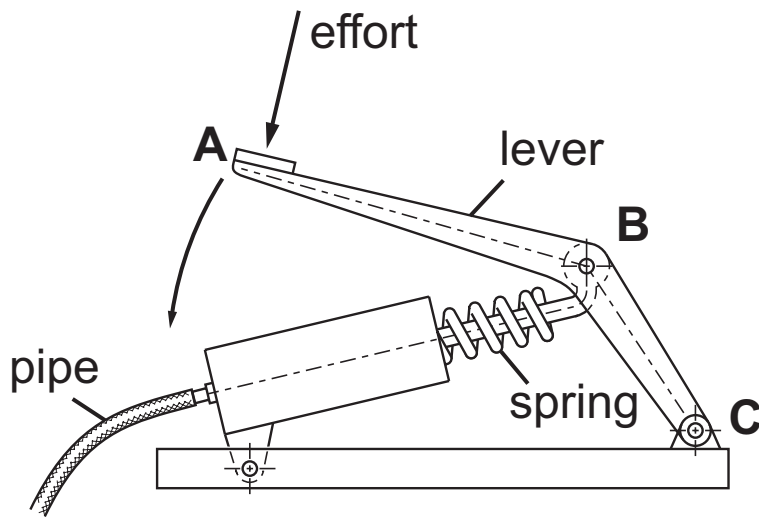
When the switch is operated, LED 1 will light up and remain on. This is the power indicator for the egg timer. The egg timer will run for 3 minutes. At the end of the 3 minutes LED 2 and the buzzer will both come on for 10 seconds to give a visual and audible signal that the timer has stopped. LED 2 and the buzzer will then turn off. This process will repeat unless the egg timer is turned off by the switch which will stop the process.

Complete the flow chart in **Fig. 7** to illustrate the process.  
[10 marks]



**Fig. 7**

10 A designer has developed a pump for inflating tyres. A sketch of the pump is shown in **Fig. 8**.



**Fig. 8**

(a) Outline **two** specification points the designer would have considered in the design of this pump. [2 marks]

1. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(b) The pump is operated by applying an effort to **A**.

(i) State the class of lever shown. [1 mark]

\_\_\_\_\_

(ii) Suggest a suitable material for the lever and give a reason for your answer.

Lever material [1 mark] \_\_\_\_\_

Reason [1 mark] \_\_\_\_\_

\_\_\_\_\_

(c) The design of the pump is to be changed by making the link **A B** longer.

Suggest what effect this change will have on:

- The size of the effort required. [1 mark]

\_\_\_\_\_

\_\_\_\_\_

- The distance moved by the effort. [1 mark]

\_\_\_\_\_

\_\_\_\_\_



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**THIS IS THE END OF THE QUESTION PAPER**

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## Sources

Pg 4, Q1, Table 1: Flame Hazard Symbol warning sign, Source: © Crown copyright

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

Examiner Number

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