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Rewarding Learning

Centre Number

7	1			

Candidate Number

General Certificate of Secondary Education
2014

Technology and Design

Unit 1: Technology and Design Core

[GTD11]

ML

FRIDAY 23 MAY, AFTERNOON

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. **Do not write 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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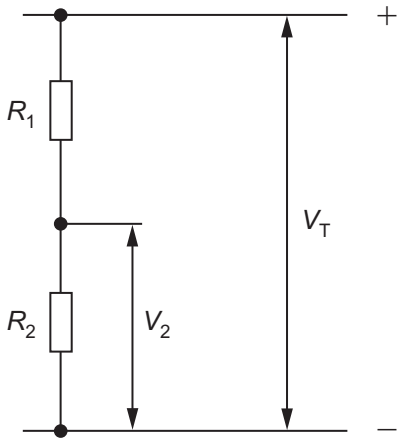
Formulae for GCSE Technology and Design

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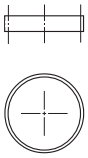
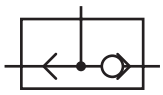
1 **Table 1** shows a number of different symbols. Use the first row as a guide to complete the table.

Examiner Only	
Marks	Remark

Table 1

Sketch of Symbol	Type of Symbol	Name of Symbol
	Electronic	Bulb
	Electronic	Variable resistor
	Mechanical	
		
 © Crown copyright	Hazard	
		Light dependent resistor
		

[9]

Total Question 1

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

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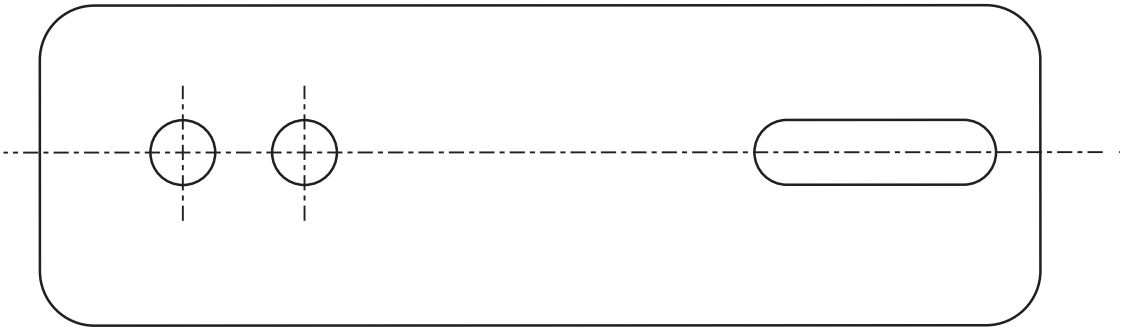

Fig. 1

(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]

(ii) What CAM process is used to manufacture the product?

_____ [1]

(b) Write down **one** advantage and **one** disadvantage of using a CAM process compared to a manufacturing process that does not use CAM.

Advantage: _____

Disadvantage: _____ [2]

Total Question 2

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

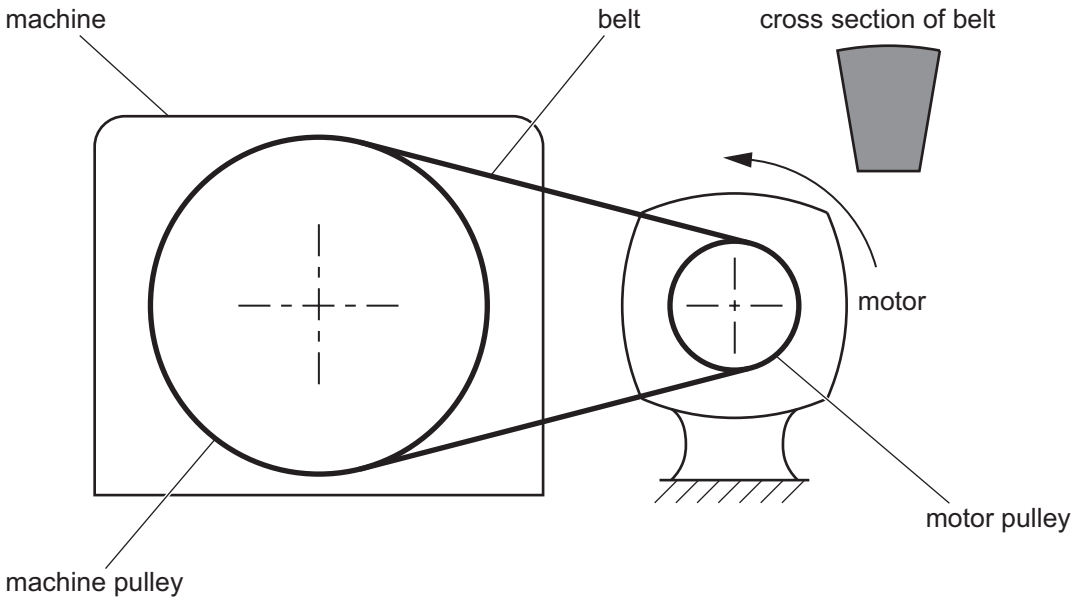

Fig. 2

(i) What is the name of the type of belt shown?

_____ [1]

(ii) Write down the type of motion at the machine pulley.

_____ [1]

(iii) Write down the name of **one** other method that could be used to transmit power from the motor to the machine.

_____ [1]

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

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

_____

_____ [2]

Total Question 3

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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.

Thermoplastic _____

_____

Thermosetting _____

_____ [2]

(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.

Table 2

Material	Thermosetting	Thermoplastic
Acrylic		
Melamine		
Polyester resin		
Rigid polystyrene		

[4]

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

Write down a reason for your choice.

Material _____

Reason _____ [2]

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

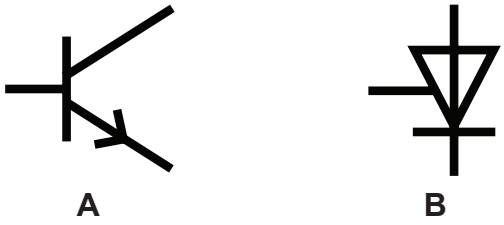

Fig. 3

(a) (i) Write down the name of each of the electronic symbols shown in **Fig. 3**.

Symbol **A** _____

Symbol **B** _____ [2]

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

(iii) For the component symbol that you have selected name the input leg.

_____ [1]

(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.

0.1 V–0.3 V 0.35 V–0.55 V 0.6 V–0.8 V

_____ [1]

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(b) (i) Both components are used as electronic switches. Outline the switching operation of each component.

Component **A** _____

_____ [2]

Component **B** _____

_____ [2]

(ii) A protective resistor is generally used with either component. Redraw either component to include its protective resistor.

[2]

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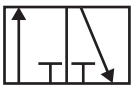
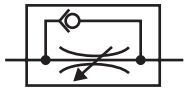
6 **(a)** Write down the name of each of the following pneumatic symbols:

(i)  _____ [1]

(ii)  _____ [1]

(iii)  _____ [1]

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

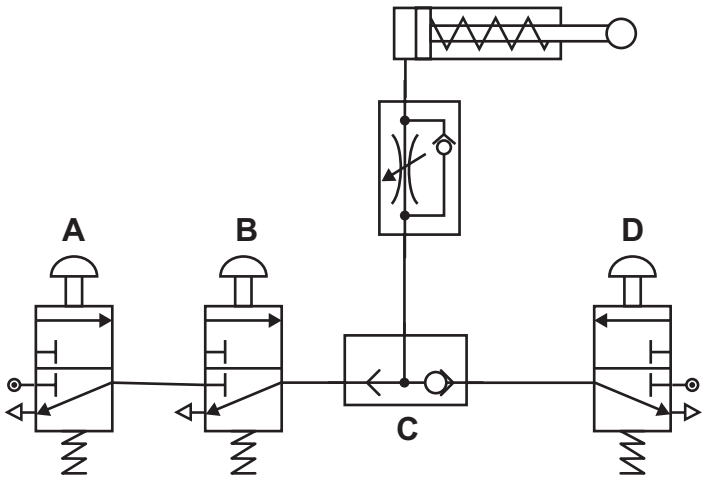


Fig. 4

(i) Write down the type of logic connection for valves **A** and **B**.

_____ [1]

(ii) Suggest a reason for using this type of connection.

_____ [1]

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(iii) Write down the **two** methods which could be used to operate the cylinder.

Method 1 _____

Method 2 _____ [2]

(iv) Explain why valve **C** is necessary in the circuit.

_____

_____ [2]

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

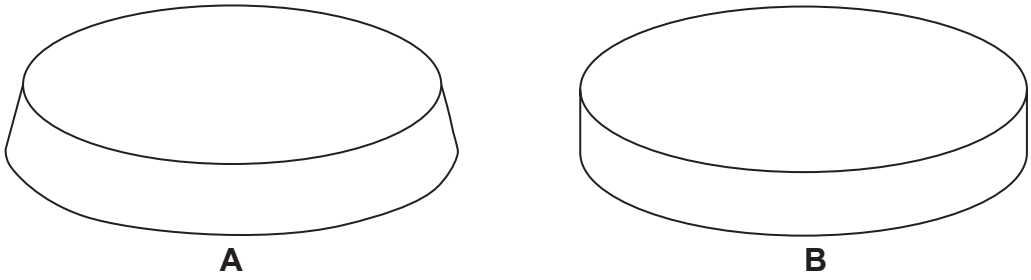

Fig. 5

(a) Explain why mould **A** was selected in preference to mould **B**.

_____

_____ [1]

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

(i) What does MDF stand for?

_____ [1]

(ii) Why would MDF be used in preference to mahogany?
Do not write about the cost in your answer.

_____

_____ [1]

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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]

Change 2 _____

_____ [1]

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8 **(a)** Write down the name of **three** tools or items of equipment that may be used when constructing an electronic circuit on a printed circuit board.

1. _____

2. _____

3. _____ [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.

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		

[6]

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

[2]

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

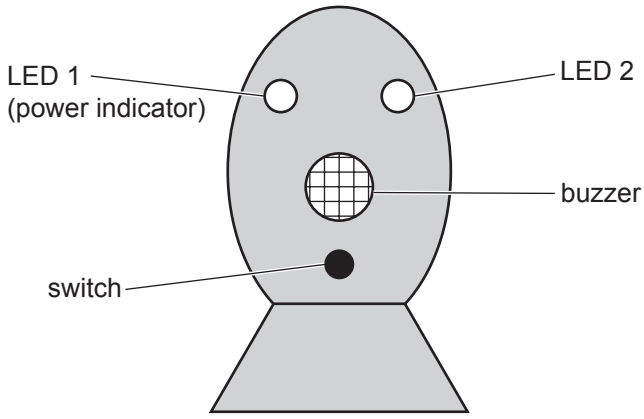

Fig. 6

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.

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Complete the flow chart in **Fig. 7** to illustrate the process.

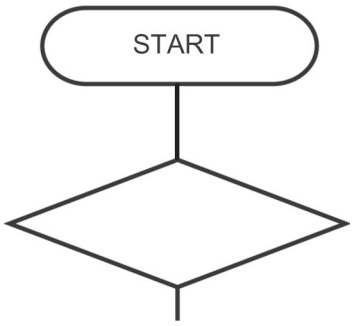

Fig. 7

[10]

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

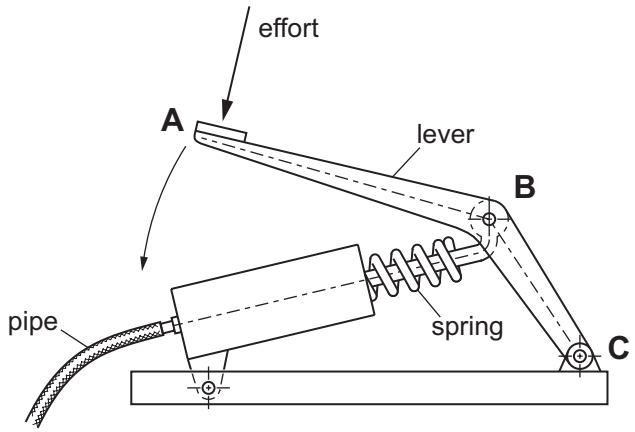

Fig. 8

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

1. _____

_____

2. _____

_____ [2]

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

(i) Write down the class of lever shown.

_____ [1]

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

Lever material _____ [1]

Reason _____ [1]

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(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]

- The distance moved by the effort.

_____ [1]

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11 The manufacture of plastic key fobs in a school workshop involves a number of procedures.
Describe the overall process giving the names of tools, equipment and machines needed to cut, shape, file, smooth and polish an oval shaped key fob made from acrylic.
Make reference to any appropriate safety precautions used in this process.

[10]

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