

Tuesday 23 May 2017 – Morning

GCSE DESIGN AND TECHNOLOGY: ELECTRONICS AND CONTROL SYSTEMS

A515/02 Sustainability and technical aspects of designing and making –
Pneumatics

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- A calculator may be used for this paper.
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 30 minutes



Candidate forename		Candidate surname	
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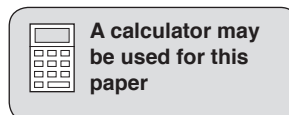
Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions in Section A **and** Section B.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.
- Show all working out for calculations.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of the question or part question.
- The total number of marks for this paper is **80**.
- Your quality of written communication is assessed in questions marked with an asterisk (*).
- Dimensions are in millimetres unless stated otherwise.
- This document consists of **16** pages. Any blank pages are indicated.



SECTION A

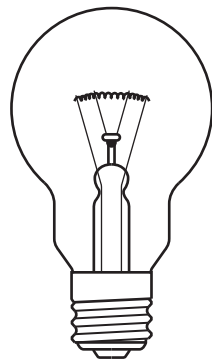
Answer **all** the questions.

You are advised to spend 40 minutes on this section.

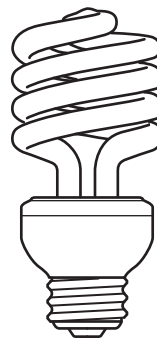
On questions 1–5 **circle** your answer.

- 1 Screw-on tops are removed from plastic containers before recycling because:
- (a) They contain different chemical properties
 - (b) They are a choking hazard
 - (c) They need cleaning separately
 - (d) It is not practical to recycle them [1]
- 2 Tertiary recycling is described as:
- (a) Using a chemical process to break down an existing product to make a new one
 - (b) The second-hand use of a product without changing or altering it
 - (c) Altering the product to use it in another way without the use of chemicals
 - (d) The dismantling of a product to produce parts that can be re-used [1]
- 3 Which statement is **not** correct?
- (a) Disassembly of a product supports the recycling process
 - (b) Disassembly of products adds to the use of landfill sites
 - (c) Knock down fittings make it easier to disassemble a product
 - (d) Disassembly makes it easier to repair a product [1]
- 4 The symbol below stands for:
-
- (a) Recycling code for plastics
 - (b) Carbon footprint
 - (c) Greenhouse emission warning
 - (d) Recycling code for a specific metal [1]

- 5 Ergonomics is the study of:
- (a) The human body and its movement
 - (b) The cost of manufacturing a product
 - (c) The life cycle of a product
 - (d) Materials and their properties [1]
- 6 Give **one** reason why products should be adapted and re-used to suit an alternative use.
..... [1]
- 7 State the meaning of the term 'carbon offsetting'.
..... [1]
- 8 Fig. 1 shows two types of light bulb.



incandescent light bulb



compact fluorescent light bulb (CFL)

Fig. 1

Give **one** reason why a compact fluorescent light bulb (CFL) is more environmentally friendly than an incandescent light bulb.

..... [1]

- 9 The sign shown in Fig. 2 is mainly coloured red.



Fig. 2

Give **one** reason why the sign in Fig. 2 is coloured red.

..... [1]

- 10 State which of the 6Rs describes not using a material because it is harmful to the environment or people.

..... [1]

Decide whether the statements below are **true** or **false**.

Tick [✓] the box to show your answer.

	True	False	
11 ETI stands for Ethical Trading Initiative.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
12 Moral issues protect the safety of users of products.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
13 The British Standards Institute regulates the price of products.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
14 Solar power is a finite source of energy.	<input type="checkbox"/>	<input type="checkbox"/>	[1]
15 Globalisation has decreased international trade.	<input type="checkbox"/>	<input type="checkbox"/>	[1]

16 Fig. 3 shows a retractable dog lead that can be extended to 10 m.

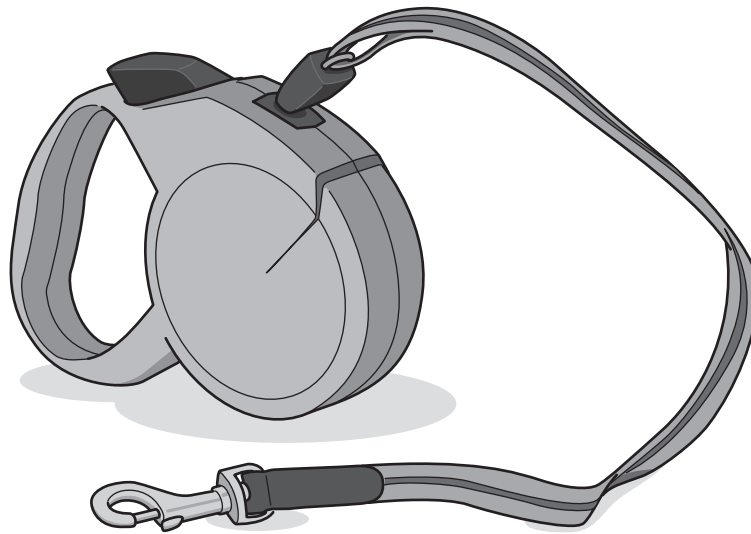


Fig. 3

(a) Identify **three** design features of the retractable dog lead in Fig. 3.

- 1.....
- 2.....
- 3.....

[3]

(b) The retractable dog lead does not require a power source to work. Give **two** benefits this has for the environment.

- 1.....
-
- 2.....
-

[2]

(c) A smart material such as phosphorescent paint can be used to coat the lead so it can be used at night.

Explain what a smart material is.

-
-

[2]

- (d) The manufacturer wishes to improve the dog lead in Fig. 3 so that it includes a night light and dog bag dispenser.

Use sketches and notes to show the improved design.
Label all materials and components used.

[5]

- (e) Corrugated card will be used as packaging for the dog lead.
Give **two** reasons why this is a suitable material for the packaging.

1.....

.....

2.....

.....

[2]

SECTION B

Answer **all** the questions.

You are advised to spend 50 minutes on this section.

17 Fig. 4 shows a pneumatically controlled drilling machine to be used for drilling holes in tubing.

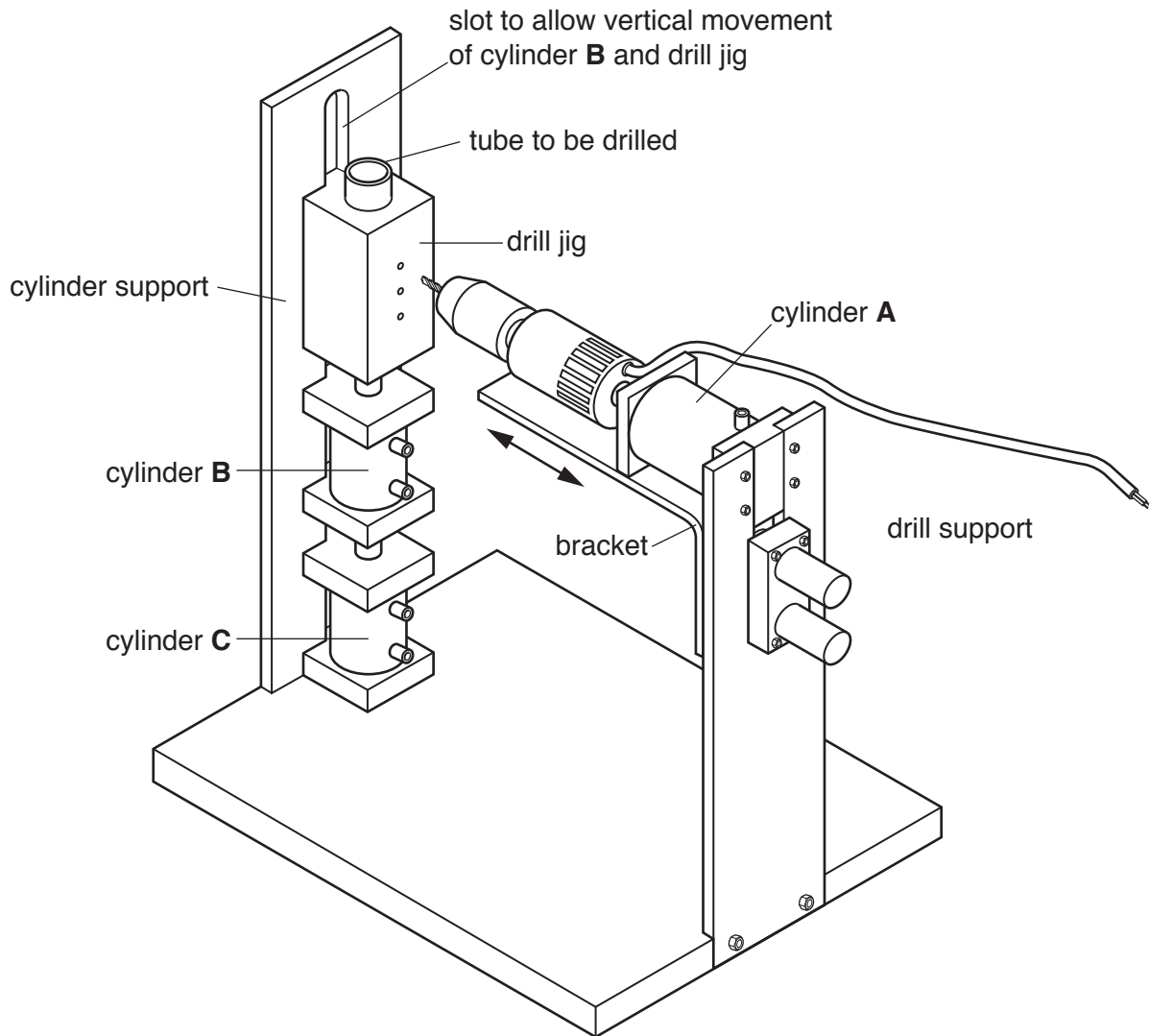
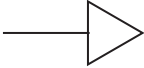
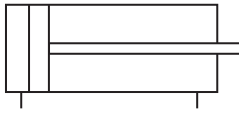
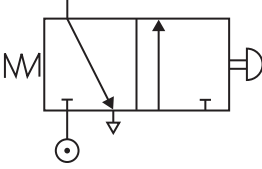


Fig. 4

(a) The table below shows the name or symbol for some of the components available for use in building the pneumatically controlled drilling machine.

(i) Complete the table by drawing the missing symbols and adding the missing names.

Name	Symbol	
<p>A air supply</p>		[1]
<p>B</p>		[1]
<p>C bi-directional flow restrictor</p>		[1]
<p>D</p>		[2]
<p>E</p> <p>.....</p>		[2]

(ii) Describe **one** method of reducing wear in pneumatic components with moving parts.

.....

.....

..... [2]

(b) Fig. 5 shows a circuit used in a drilling machine.

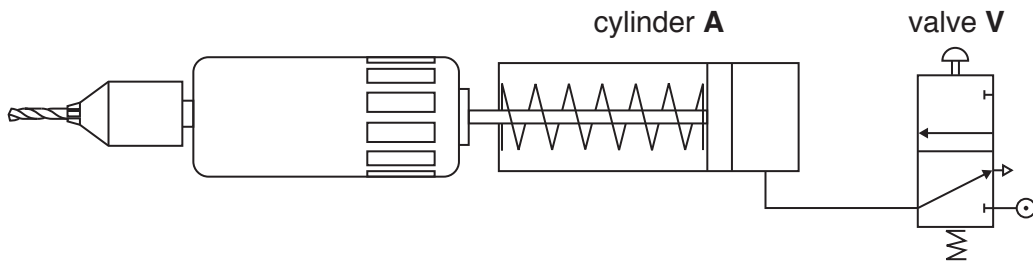


Fig. 5

(i) Describe what happens when valve V is pressed and released immediately.

.....

 [2]

(ii) Describe what happens when valve V is pressed and held down.

.....

 [2]

(iii) Explain why it is important to check the type of material the tube is made from before starting the drill.

.....

 [1]

(iv) State **one** safety related procedure that should be carried out before the drill is used.

..... [1]

18 (a) Fig. 6 shows the cylinders and valves used in the pneumatically controlled drilling machine.

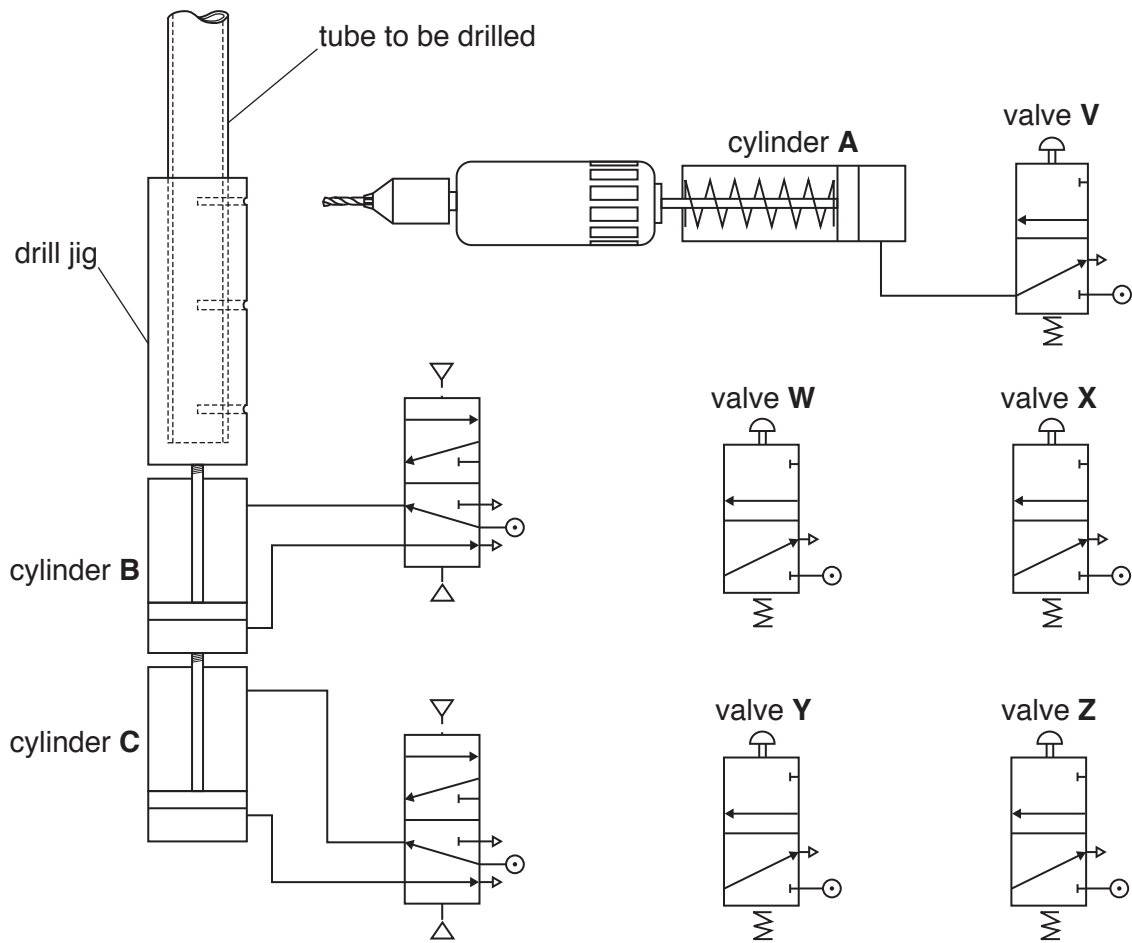


Fig. 6

(i) Complete Fig. 6 to show the connections between the valves to allow the pneumatically controlled drilling machine to:

- outstroke cylinder B when valve W is pressed
- instroke cylinder B when valve X is pressed
- outstroke cylinder C when valve Y is pressed
- instroke cylinder C when valve Z is pressed.

[4]

- (ii) The drilling assembly and bracket are shown in Fig. 7. Use sketches and notes to show a method of fixing the drill to the bracket so that it can be removed if necessary and is accurately aligned.

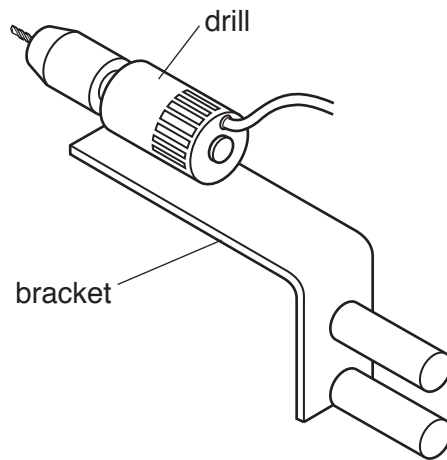


Fig. 7

- 19 Fig. 8 shows the drill jig.
 The distances between the three holes in the drilling jig are the same as the stroke of cylinders **B** and **C**.

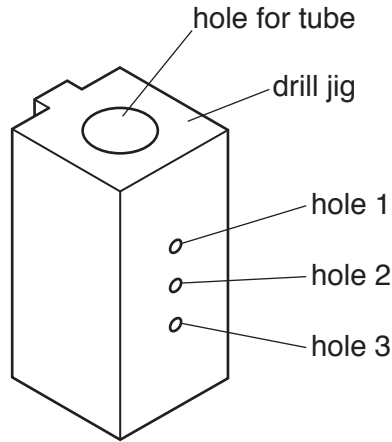


Fig. 8

Hole 1 is drilled with both cylinders instroked.
 Cylinder **B** outstrokes first to position the jig for drilling hole 2.
 Cylinder **C** outstrokes next to position the jig for drilling hole 3.
 Assume that valve **V** will be pressed and then released for long enough to completely drill each hole.

- (a) In the chart below complete the sequence of drilling all three holes in a tube placed in the jig. The sequence should end with all three holes drilled and ready to replace the tube for the next one to be drilled.
 Place the letter of the valve in the box. The first two have been completed for you.



[5]

- (b) Cylinder **A** has a diameter of 25 mm and the force required to overcome the spring and the drilling process is 60 N.

Calculate the minimum pressure required to carry out the drilling process.

Use the formula $F = P \times A$

.....

[4]

- (c) The pneumatically controlled drilling machine could be upgraded to operate automatically using a microprocessor.
The upgrading would include replacing the cylinders with the type shown in Fig. 9.

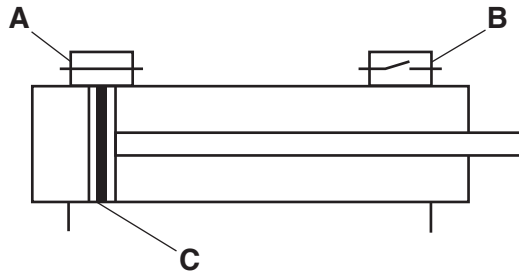


Fig. 9

- (i) Name the component shown in Fig. 9.

..... [2]

- (ii) Describe how the component in Fig. 9 could be used in an automated system controlled from a microprocessor.
Make reference to **A**, **B** and **C** in your answer.

.....
.....
.....
..... [2]

- (iii) Give **two** advantages of replacing the electric drill with a pneumatic drill.

1
.....
2
..... [2]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large rectangular area with a solid vertical line on the left side and horizontal dotted lines across the rest of the page, providing space for writing answers.



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