

Tuesday 24 May 2016 – Morning

**GCSE DESIGN AND TECHNOLOGY
Electronics and Control Systems**

A515/03 Sustainability and technical aspects of designing and making –
Mechanisms

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 | |
|-----------------------|--|----------------------|--|

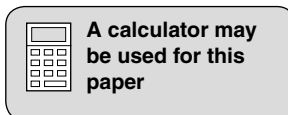
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| Centre number | | | | | | Candidate number | | | | |
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INSTRUCTIONS TO CANDIDATES

- 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. Make sure 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 bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each 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 (*).
- This document consists of **20** 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** Fitting thermal insulation glass to a house:
- (a) Lets in double the light
 - (b) Re-uses glass from another house
 - (c) Increases passive solar gain
 - (d) Helps keep the loft warm [1]
- 2** Assessing potential dangers in an electronics factory is called:
- (a) Making eco-friendly products
 - (b) Undertaking a risk assessment
 - (c) Complying with the fair trade initiative
 - (d) Cooling an electronic hot spot [1]
- 3** Approaching a problem differently is:
- (a) Repetition
 - (b) Reversal
 - (c) Afterthought
 - (d) Rethinking [1]
- 4** Eco-design is used when designing a product to make it:
- (a) As environmentally friendly as possible
 - (b) Easy to manufacture as quickly as possible
 - (c) Usable anywhere in the world
 - (d) Make as much money as possible [1]
- 5** In the 6Rs, 'Reduce' refers to:
- (a) Making a product easy to disassemble
 - (b) Accepting lower profits
 - (c) Using fewer materials
 - (d) Lowering delivery charges [1]

- 6 Name **one** smart material that can shorten its length when electrically heated.
..... [1]
- 7 State why lead should not be used in electronic products.
..... [1]
- 8 Give **one** reason why video-conferencing on the internet can reduce your carbon footprint.
.....
..... [1]
- 9 State the meaning of the term 'sweatshop'.
..... [1]
- 10 Name **one** plastic made from oil.
..... [1]

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

Tick [✓] the box to show your answer.

- | | True | False | |
|---|--------------------------|--------------------------|-----|
| 11 Geothermal power generation contributes to global warming. | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 12 Renewable resources are in limited supply. | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 13 CFCs improve the ozone layer. | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 14 The Ethical Trading Initiative is global. | <input type="checkbox"/> | <input type="checkbox"/> | [1] |
| 15 Environmentally friendly packaging decomposes naturally. | <input type="checkbox"/> | <input type="checkbox"/> | [1] |

16 Fig. 1 shows an MP3 speaker unit in closed and open positions.

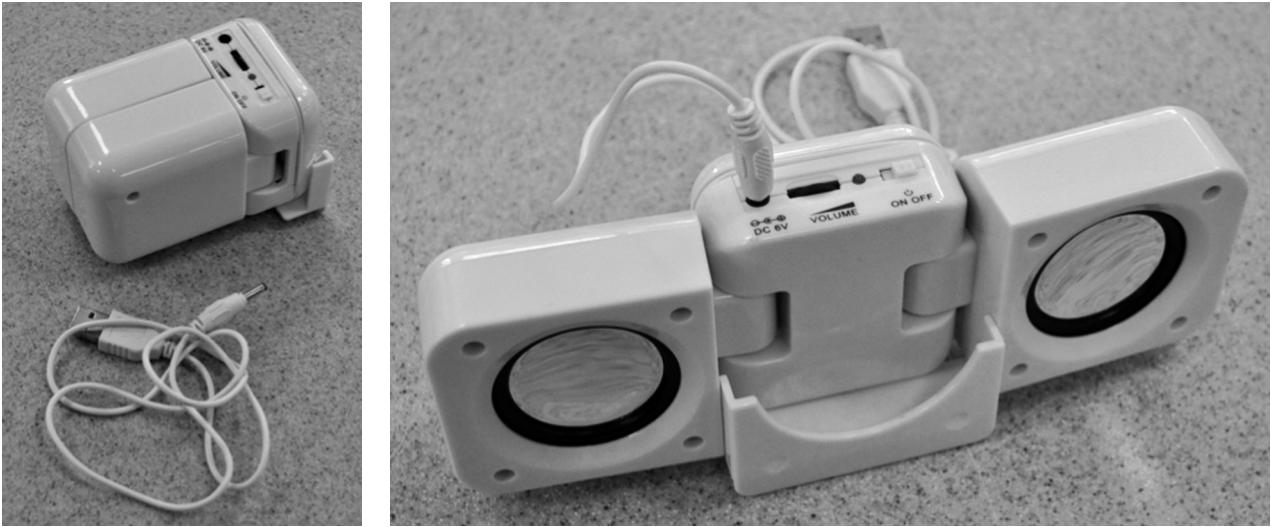


Fig. 1

(a) Identify **three** design features of the MP3 speakers shown in Fig. 1.

- 1
-
- 2
-
- 3
-

[3]

(b) The MP3 speakers can be powered from either a USB socket or from internal batteries.

Give **two** benefits of using the USB power source.

- 1
-
- 2
-

[2]

PLEASE DO NOT WRITE ON THIS PAGE

Turn over for the next question

(c) An MP3 speaker unit is to be made from recycled components.

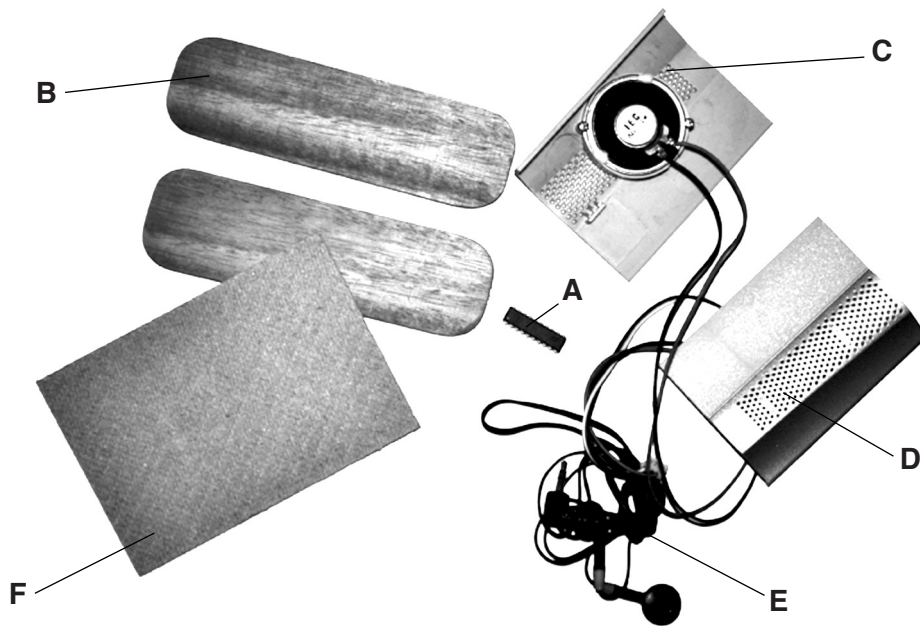


Fig. 2

Fig. 2 shows the parts collected.

Identify the parts from Fig. 2, and complete the table below with the correct description. One has been done for you.

| Name of part | Letter on Fig. 2 |
|---|------------------|
| Integrated Circuit (IC) audio amplifier | A |
| Loudspeaker from PC monitor | |
| MP3 player earphone lead with broken earphones | |
| Piece of hardboard salvaged from back of a cupboard | |
| Speaker grill from broken PC monitor | |
| Tropical hardwood from old school bench | |

[5]

(d) Use sketches and notes to design an MP3 speaker unit using the parts shown in Fig. 2.

[4]

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Turn over for the next question

10
SECTION B

Answer **all** the questions.

You are advised to spend 50 minutes on this section

17 Fig. 3 shows part of a lawn mowing machine.

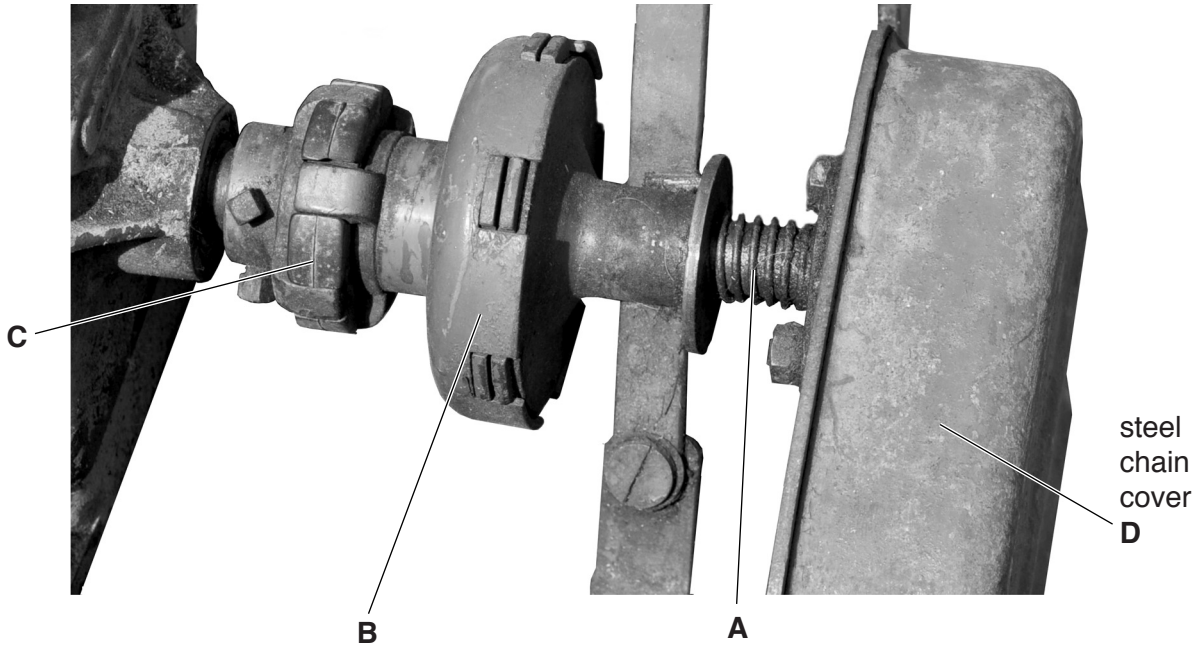


Fig. 3

(a) (i) Identify the parts from Fig. 3 and complete the table below with the correct description.

One has been done for you.

| Name of part | Letter on Fig. 3 |
|-------------------|------------------|
| Steel chain cover | D |
| Flexible coupling | |
| Clutch | |
| Spring | |

[3]

(ii) The spring is under compression.

Explain the meaning of compression.

.....

.....

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

(iii) Describe the purpose of a flexible coupling.

.....

 [2]

(iv) Describe the function of a clutch in a mechanical drive system.

.....

 [3]

(b) The steel chain cover labelled **D** in Fig. 3 has been made from a ductile material. Explain the meaning of ductile.

.....

 [2]

(c) Petrol-powered garden tools are being replaced by cordless electrical garden tools.

Tick (✓) the **three** statements which are advantages of cordless electrical garden tools compared with petrol-powered garden tools.

| Does not produce toxic fumes | High power | Limited duration | Zero pollution at point of use | Can be refilled | No flammable liquids needed |
|------------------------------|------------|------------------|--------------------------------|-----------------|-----------------------------|
| | | | | | |

[3]

18 Fig. 4 shows part of a damaged mains cable on an electrical power tool.



Fig. 4

(a) (i) The wire above uses PVC insulation. Complete the following to give the meaning of the abbreviation PVC.

Poly V..... C..... [1]

(ii) State the hazard for anyone using the damaged mains cable.

..... [1]

(b) Hand tools powered by mains electricity may need to use an extension lead as shown in Fig. 5.

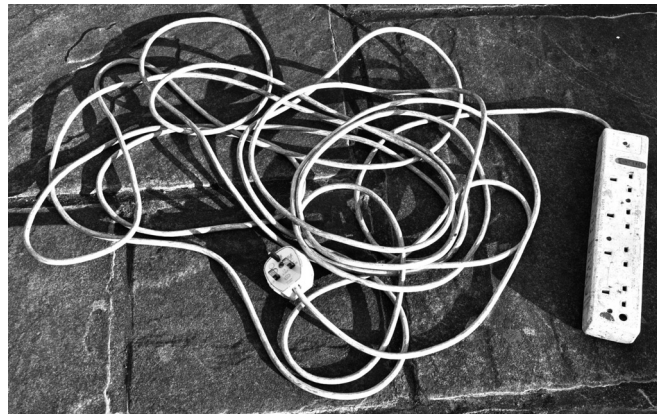


Fig. 5

Give **two** disadvantages of the extension lead shown in Fig. 5.

1

.....

2

.....

[2]

(c) A wall-mounted cable storage device is needed.

Use sketches and notes to design a wall-mounted secure cable storage device.
The design must show:

- a drum to hold cable
- a handle or winding mechanism
- security from theft
- power on/off indicator.

19 Fig. 6 shows a workshop electric drill stand.

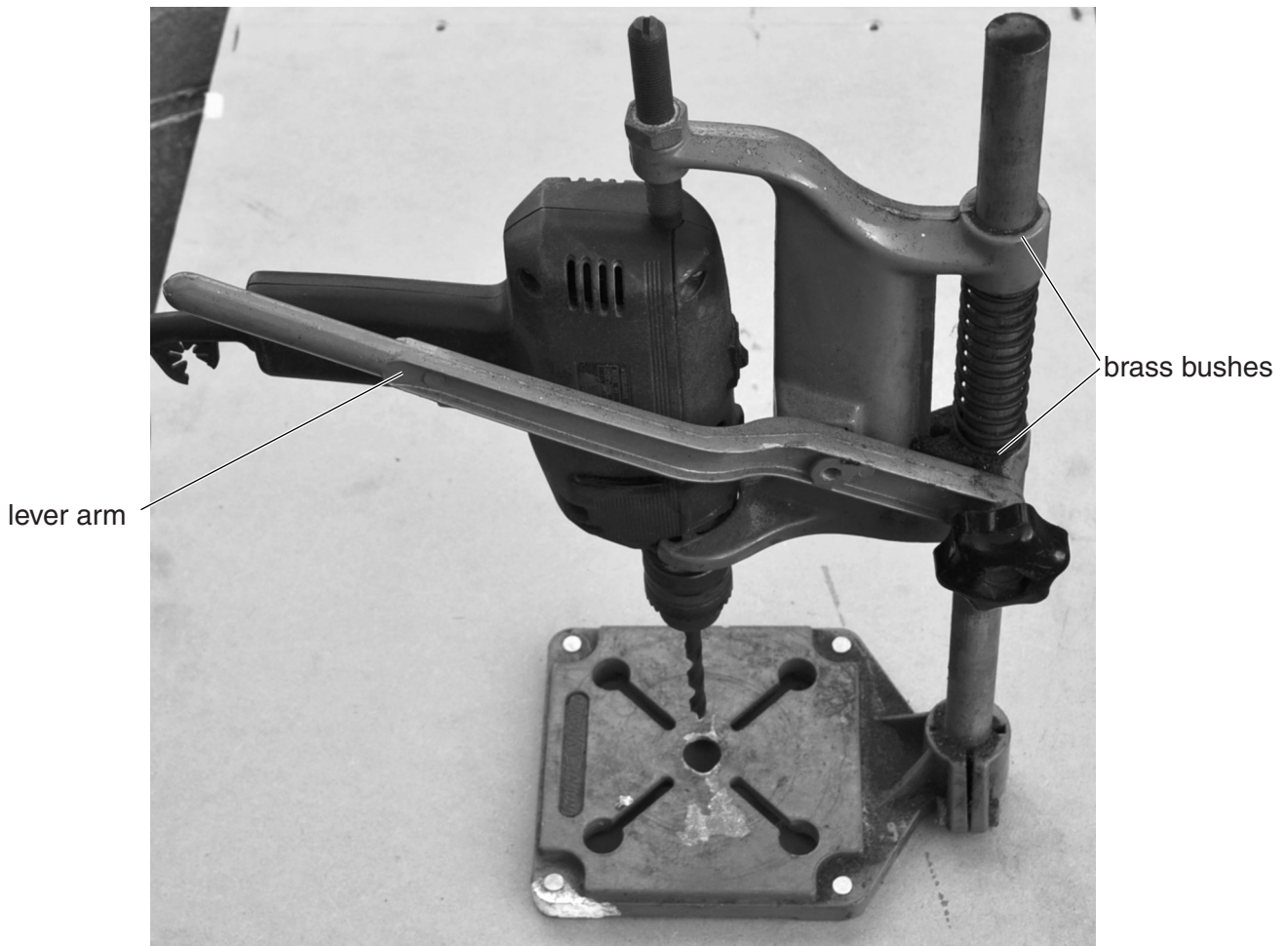


Fig. 6

(a) (i) The drill stand uses a lever as part of the operating mechanism.

Explain why a lever has been used.

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

(ii) The drill stand base could be fitted to a piece of manufactured board.

State the name of **one** manufactured board.

..... [1]

(iii) Give **three** safety precautions a user should employ before using the drill stand to drill sheet metal.

- 1
-
- 2
-
- 3
-

[3]

(iv) Brass bushes have been used on Fig. 6. Brass is an alloy of two different metals.

Name the **two** metals used to make brass.

- 1
- 2

[2]

(b) Fig. 7 shows a chuck key being used to tighten the drill chuck on a drill.



Fig. 7

(i) The chuck key uses leverage and gearing to achieve a mechanical advantage.

Explain what is meant by a mechanical advantage.

-
-
-

[2]

(ii) The drill is not 100% efficient.

Explain what can reduce efficiency in a mechanism.

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

(iii) Modern drills often have a keyless chuck.

Give two **disadvantages** of a keyless chuck.

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

(iv) The frame of the drill stand is made of aluminium.

Name the process used to produce the main body of the drill stand.

..... [1]

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 margins.

A large area of lined paper for writing answers. It consists of a vertical solid line on the left side, creating a margin, and horizontal dotted lines extending across the page to the right. The lines are spaced evenly down the page.

A large area of the page is reserved for writing, featuring a vertical margin line on the left and horizontal dotted lines for text alignment.



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