OCR
Oxford Cambridge and RSA

Tuesday 24 May 2016 – Morning

GCSE DESIGN AND TECHNOLOGY: ELECTRONICS AND CONTROL SYSTEMS

A515/01 Sustainability and technical aspects of designing and making – Electronics

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

A515 01

5942119015

Candidate forename		Candidate surname	

Centre number						Candidate number				

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 bar codes.
- 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 **20** pages. Any blank pages are indicated.

A calculator may be used for this paper

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.	☐	☐	**[1]**
12 Renewable resources are in limited supply.	☐	☐	**[1]**
13 CFCs improve the ozone layer.	☐	☐	**[1]**
14 The Ethical Trading Initiative is global.	☐	☐	**[1]**
15 Environmentally friendly packaging decomposes naturally.	☐	☐	**[1]**

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

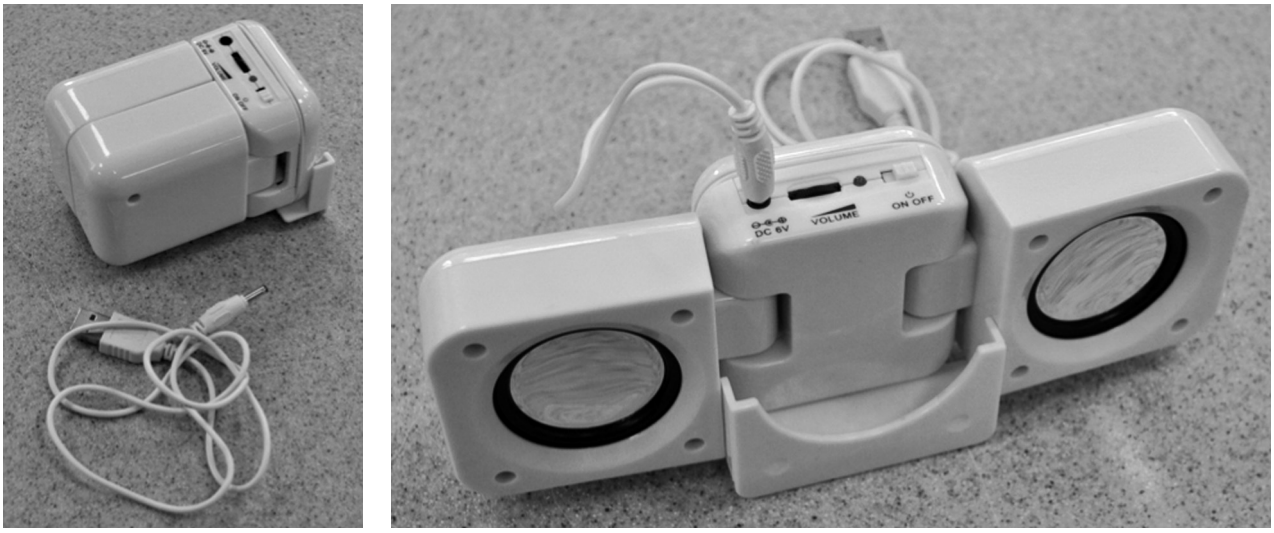


Fig. 1

(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]

BLANK PAGE

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.

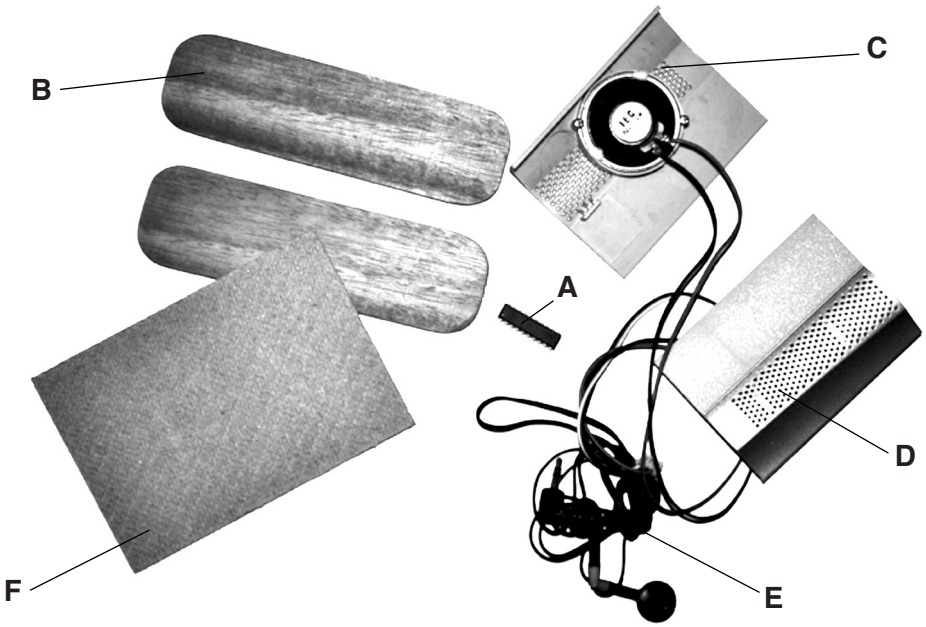


Fig. 2

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]

(e)* Discuss how designers of products can use components sourced from secondary recycling to reduce a product's carbon footprint. Use examples in your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Turn over for the next question

SECTION B

Answer **all** the questions.

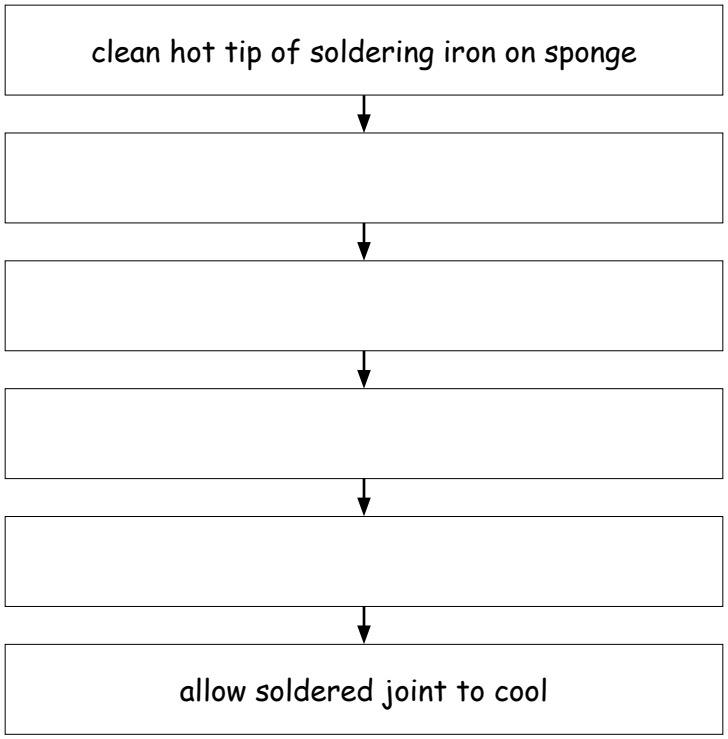
You are advised to spend 50 minutes on this section.

17 Fig. 3 shows a 230 V soldering iron used by an electronics company.

Fig. 3

(a) (i) Insert the statements below, in the correct order, to complete the block diagram of the soldering process.

- **feed the solder into the joint**
- **place the tip of the soldering iron onto the joint**
- **tin the soldering iron**
- **allow heat to conduct**



[3]

(ii) Faulty soldering can lead to 'dry' joints.
State the meaning of a 'dry' joint.

..... **[1]**

(iii) State **two** ways a dry joint can be identified.

1 .....

2 .....
[2]

(b) (i) Give **one** safety precaution that the company should take to meet COSHH regulations, before allowing workers to use the soldering iron.

..... **[1]**

(ii) Give **one** electrical safety precaution that a user of the soldering iron should take.

..... **[1]**

(iii) The tip of the soldering iron is made from electro-plated copper.
Explain why this material is used.

.....

.....

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

(c) Fig. 4 shows a liquid crystal display (LCD) modular unit.

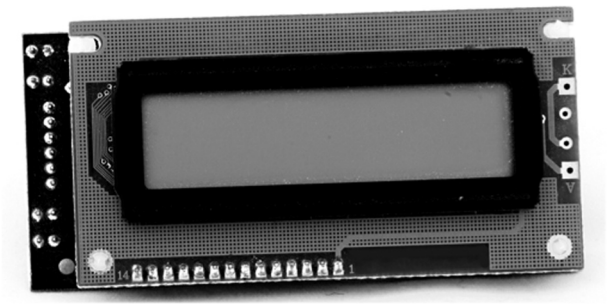


Fig. 4

(i) Give **two** benefits of using modular units, rather than individual components.

1 .....

.....

2 .....

.....
[2]

(ii) State **three** features of the LCD modular unit that will be important to a circuit designer.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

18 (a) Fig. 5 shows one of four self-adhesive PCB mounting pillars used to fix a circuit board to a project casing.

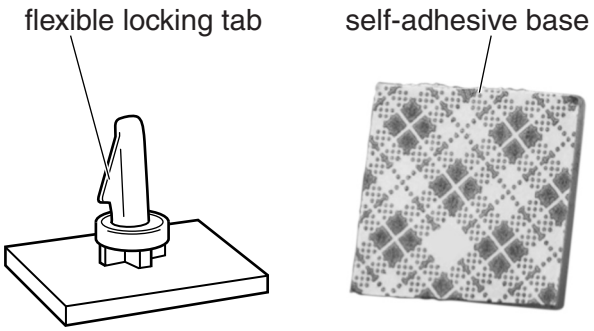


Fig. 5

Describe how the PCB mounting pillars can be accurately aligned with the Ø4 mm holes in the circuit board when they are being fixed in position.

.....

.....

.....

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

(b) (i) State **two** factors, other than cost, that will influence the choice of wire used for connections to a PCB.

1 .....

.....

2 .....

.....

[2]

(ii) Fig. 6 shows part of a PCB where the wires from a sensor enter the board. Use notes and sketches to show **one** method of strain relief for the wires.

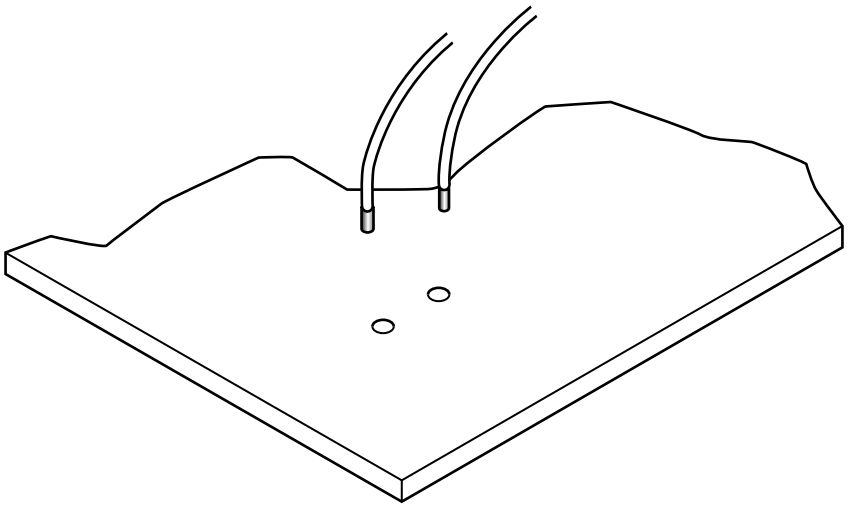


Fig. 6 **[2]**

(iii) Three alternative methods of connecting wires to a circuit board are shown in Fig. 7.

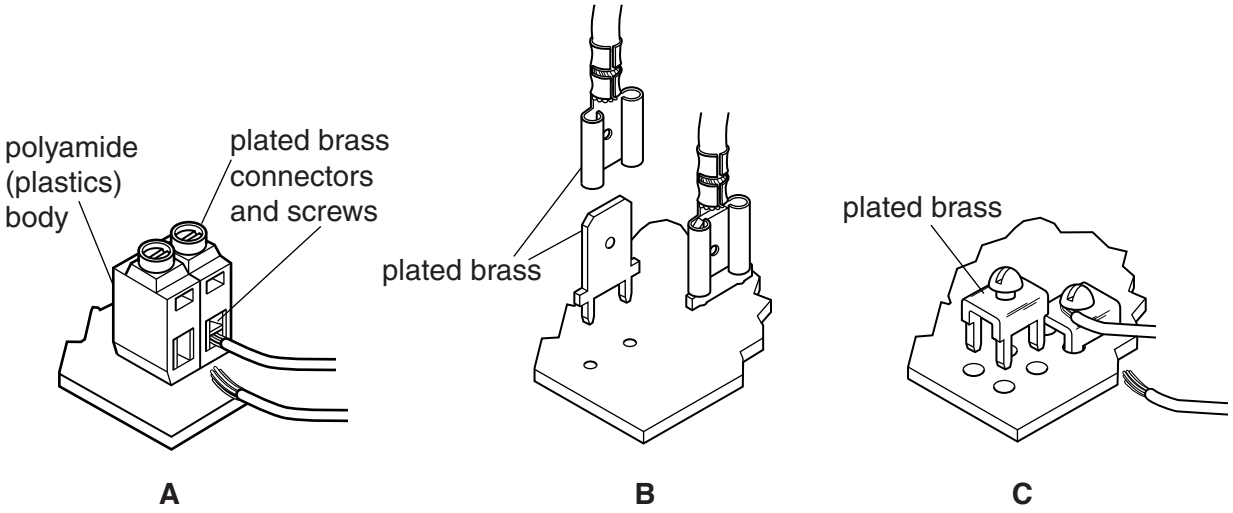


Fig. 7

Give **one** different benefit for each method.

A .....

.....

B .....

.....

C .....

.....

[3]

(c)* Printed circuit boards can be designed, tested and manufactured using computer aided technology.

Discuss the benefits and drawbacks of computer aided technology compared with traditional methods for printed circuit board manufacture.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

19 Outside doors to school reception areas are often locked during the day to restrict access to the building.

An electronic door release inside the reception area is used to release the lock, allowing the door to be opened.

(a) Fig. 8 shows a monostable circuit that could operate the electronic door release.

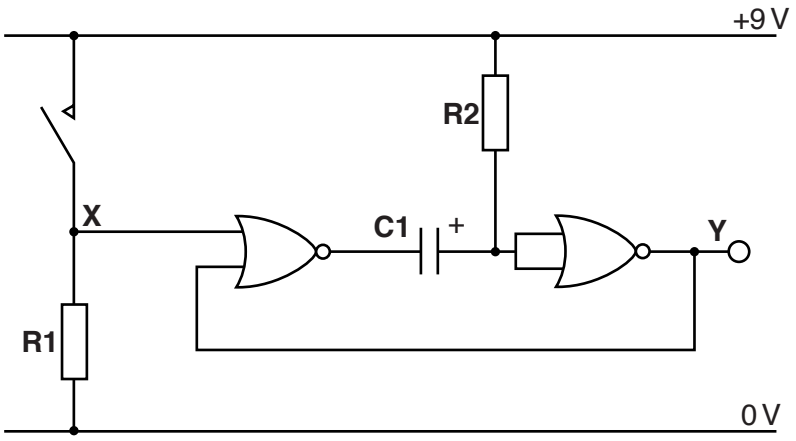


Fig. 8

(i) Name the logic gates used in the system.

..... **[1]**

(ii) A push-to-make (PTM) switch operates the door release.
State the logic level at point **X** when the switch is pressed.

..... **[1]**

(iii) Explain the purpose of resistor **R1**.

.....

.....

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

(b) **(i)** When the release switch is pressed, the output at **Y** changes from low to high for the 5 second time period of the monostable.
Calculate the value of **R2** if the value of capacitor chosen is 100 µF.

Use the formula $t = 0.7 \times C \times R$

.....

.....

.....

..... **[3]**

(ii) Complete the graph in Fig. 9 to show **one** output pulse from the monostable.

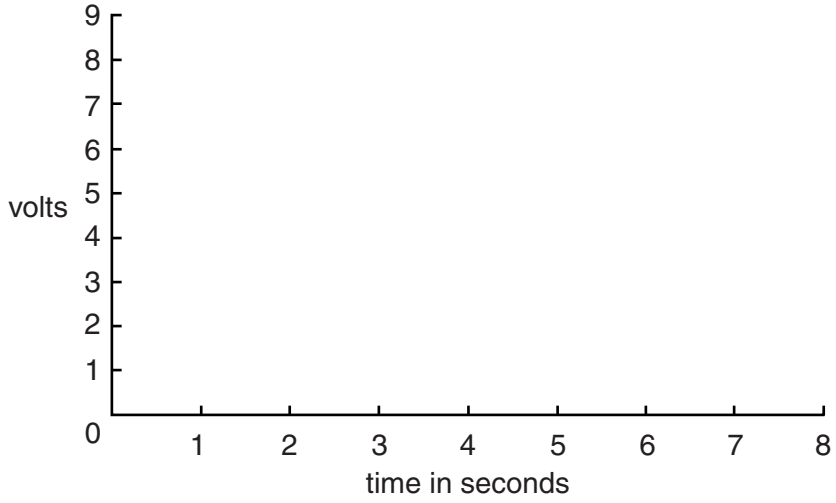


Fig. 9 **[2]**

(c) Fig. 10 shows the solenoid lock to be used in the electronic door release.

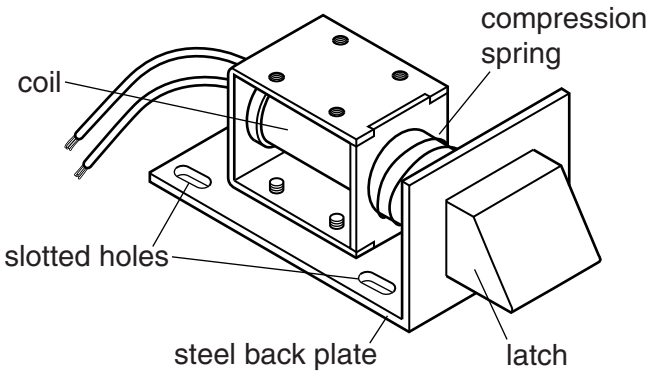


Fig. 10

(i) State the function of the compression spring.

.....

..... **[1]**

(ii) Describe how the slotted holes in the steel back plate in Fig. 10 could be produced. Use notes and sketches in your answer.

[2]

(d) Fig. 11 shows part of the driver circuit for the solenoid.
Add the following:

- a connection from monostable output **Y** to input pins 1, 2 and 3 of the IC
- a connection between output pins 16, 17 and 18
- connections to the solenoid.

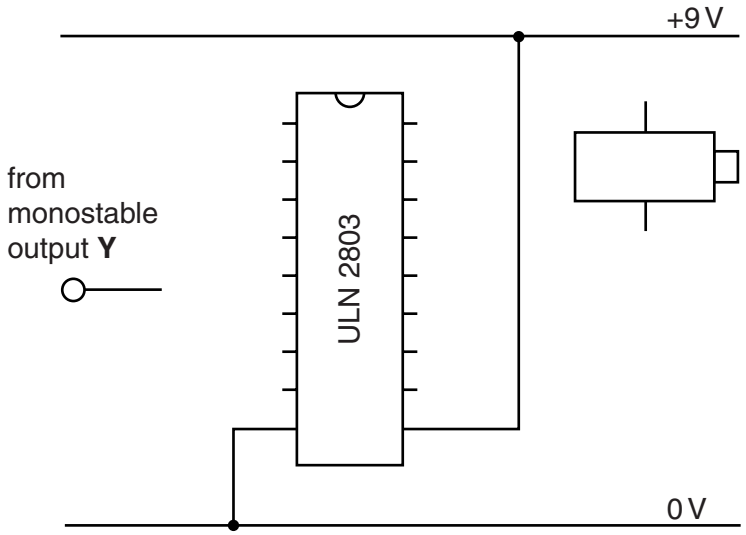


Fig. 11

[3]

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.