OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

DESIGN AND TECHNOLOGY

Electronic Products **1953/01**

Electronic Products (Short Course) **1053/01**

Paper 1 (Foundation Tier)

Systems & Control Technology (Electronics Option) **1957/03**

Paper 3 (Foundation Tier)

MONDAY 2 JUNE 2008

Morning

Time: 1 hour

Candidates answer on the question paper

Additional materials: No additional materials are required

CUP/T41137

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.
- Show all working for calculations.
- All necessary formulae are provided within the questions. No extra formulae sheet is required.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **50**.
- Marks will be awarded for the use of correct conventions.
- Dimensions are in mm unless stated otherwise.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
TOTAL	

This document consists of **12** printed pages.

[Turn over

1 Electronic products are often used in personal transport systems.
Some examples are shown in Fig. 1.

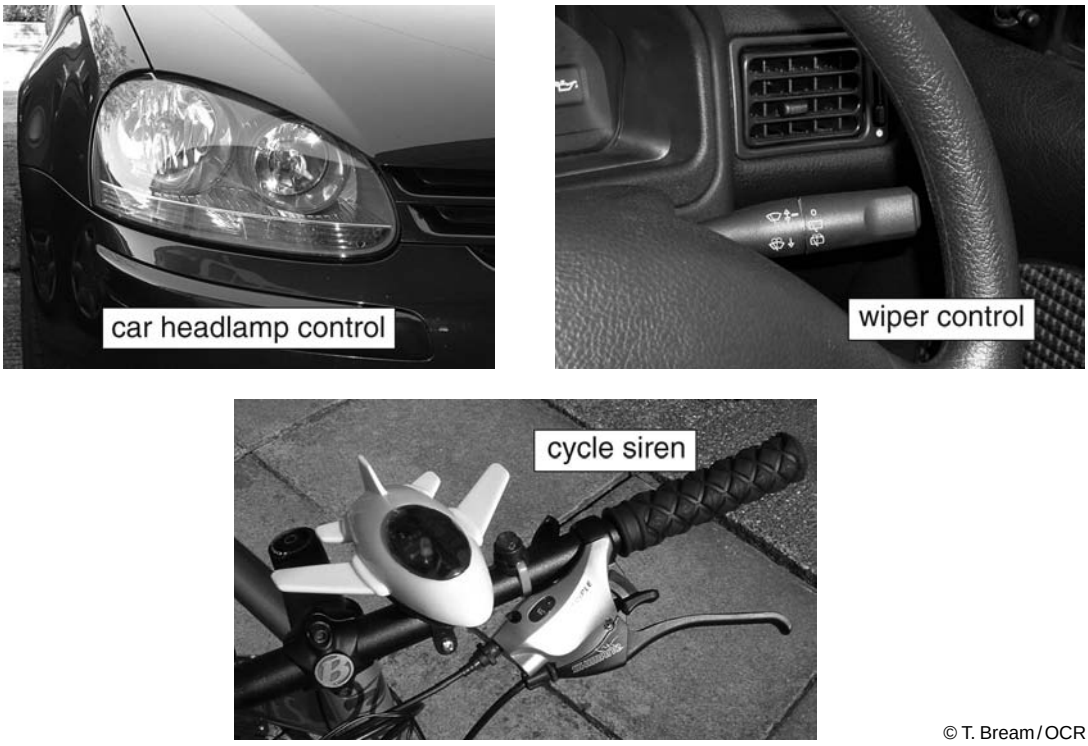


Fig. 1

(a) Many of the products used in personal transport systems use LEDs to display information.

(i) Fig. 2 shows a standard LED.

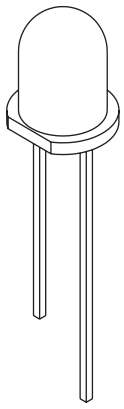


Fig. 2

Give the full name of the LED.

L ..... E ..... D ..... [3]

(ii) LEDs are available in a range of colours.
State **two** other ways in which LEDs can be different.

1 .....

2 .....[2]

(b) LEDs must be used with a protective resistor.
Only **two** of the following statements are true.
Tick [✓] the box next to the **two** true statements. **Do not tick more than two boxes.**

A protective resistor will reduce voltage in the LED circuit. ☐

A protective resistor will reduce current in the LED circuit. ☐

A protective resistor can be used to change the colour of an LED. ☐

A protective resistor can change the brightness of an LED. ☐ [2]

(c) LEDs must be placed correctly in a circuit or they will not work.
A standard LED has a flat on the edge to indicate the cathode (negative leg).
Give **one** other method of identifying the cathode of an LED.

.....

.....[1]

(d) Fig. 3 shows a circuit board with an LED soldered in position.
The solder has bridged the two pads.
Use notes or sketches to describe how the excess solder can be removed.

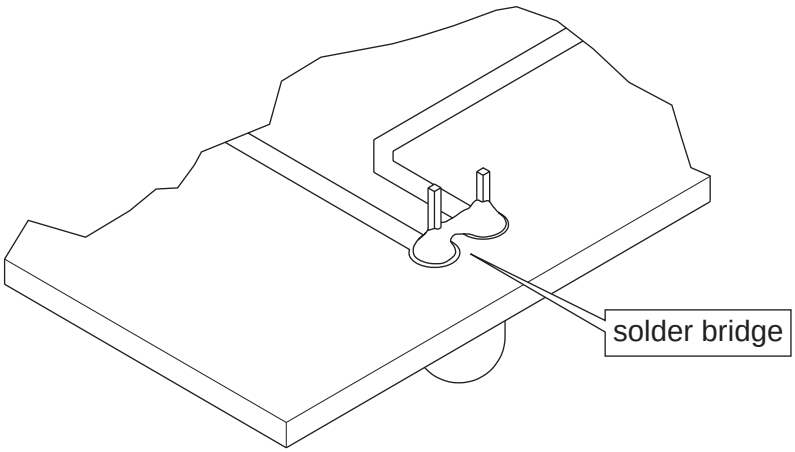


Fig. 3

.....

.....

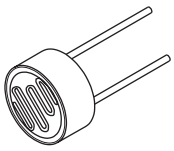
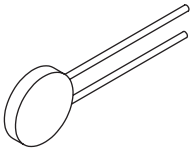
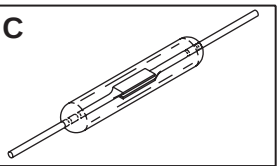
.....[2]

[Total: 10]

2 **(a)** **(i)** Sensing devices are often used in personal transport systems.
Use the list below to complete the table of sensor information.

light **heat** **LDR**

movement **reed switch** **thermistor**

	A 	**B** 	**C** 
name of sensor			
condition sensed			

[3]

(ii) Each of the sensors can indicate a change in condition by falling resistance.
Fig. 4 shows time against resistance graphs for each of the sensors.
Explain why sensor **C** has a much faster reaction time compared to the other two sensors.

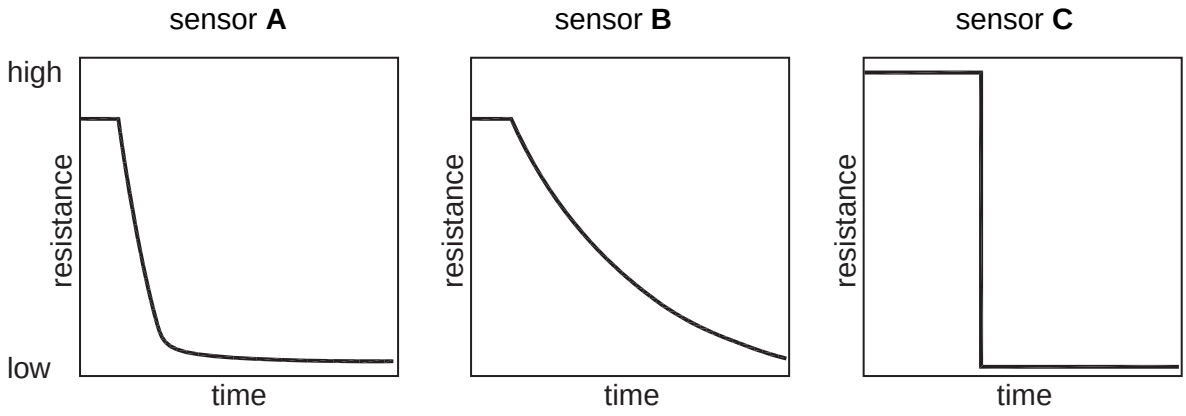


Fig. 4

.....

.....

.....[2]

(b) Fig. 5 shows the sensing part of a circuit for switching car headlights on automatically when it is dark.

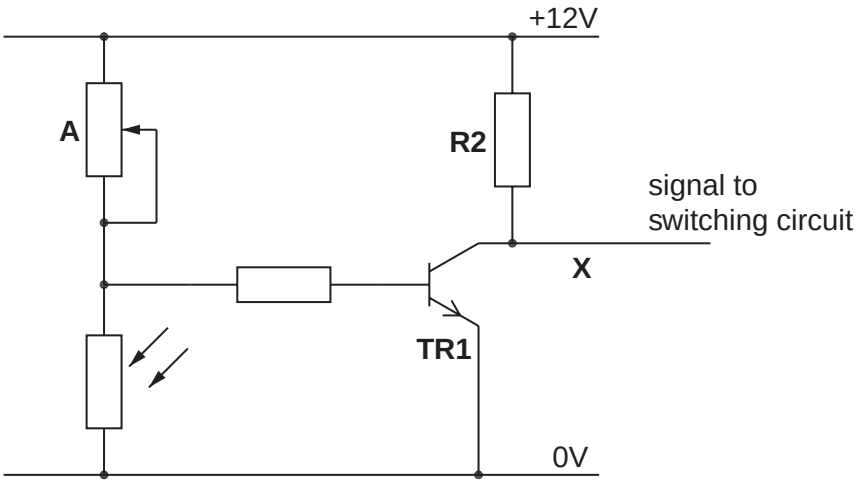


Fig. 5

(i) State the purpose of component **A** in the circuit.

.....[1]

(ii) Resistor **R2** is sometimes known as a pull up resistor.
Describe the effect of the pull up resistor on the signal at point **X**.

.....

.....[1]

(c) Component **TR1** is a small plastic cased NPN transistor.
Fig. 6 shows details of the transistor and fitting method, using a plastic transistor pad.

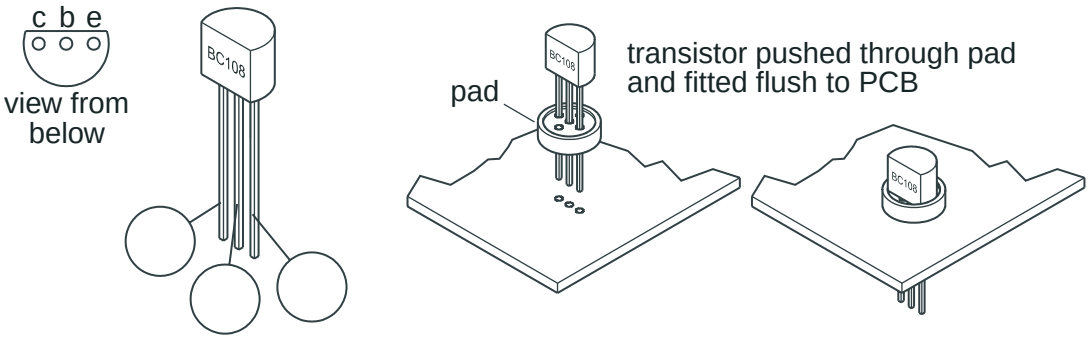


Fig. 6

(i) Use the information from the pin data of the transistor to label each leg of the transistor. [2]

(ii) Give **one** reason for using a transistor pad.

.....[1]

[Total: 10]

3 **(a)** A circuit is being developed to vary the delay between sweeps of car windscreen wipers. The circuit will allow the wipers to operate every few seconds depending on the level of rain falling.
The graph in Fig. 7 shows a suitable output pulse with a frequency of 0.5 Hz.

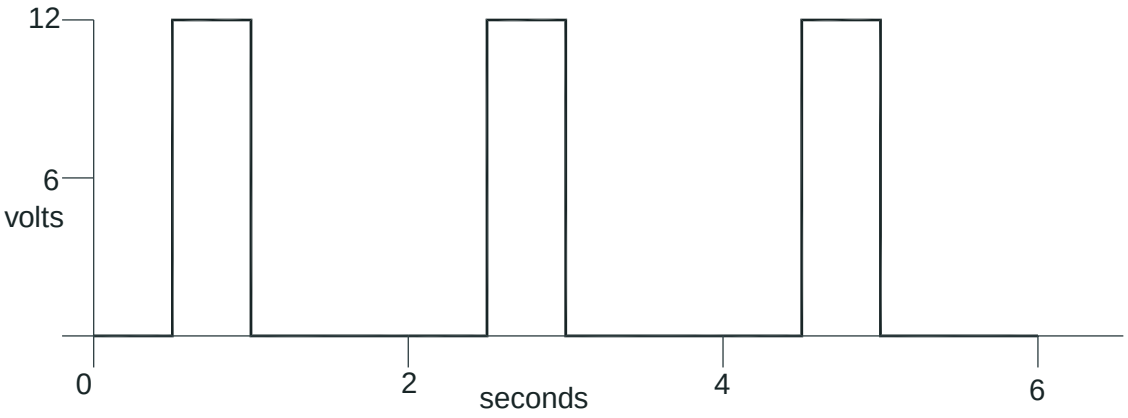


Fig. 7

(i) Describe the type of wave form shown.

.....[1]

(ii) **One** of the words below describes this type of output.

Tick [✓] the box next to the correct word.

astable ☐ bistable ☐ monostable ☐

[1]

(b) A suitable circuit for the delay is shown in Fig. 8.

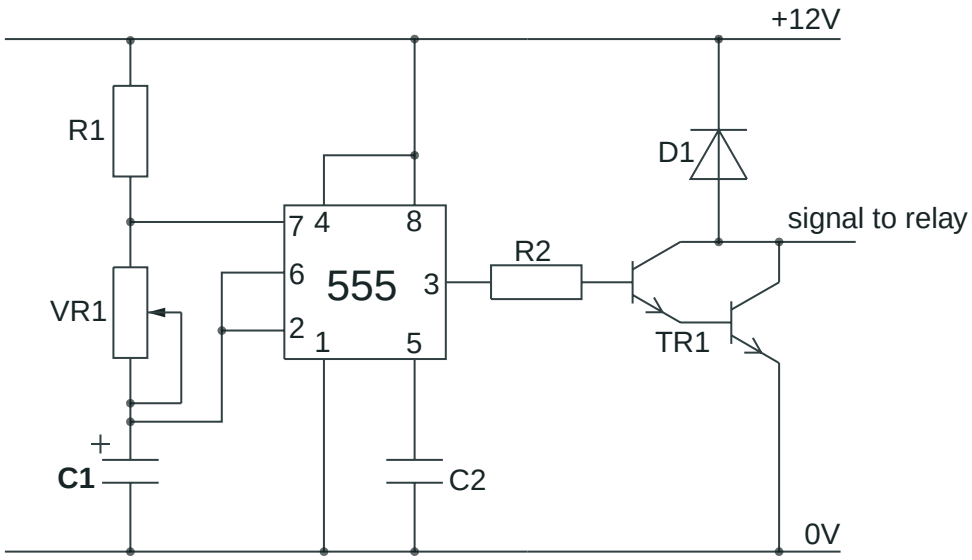


Fig. 8

(i) Capacitor **C1** is one of the timing components in the circuit.
State the **two** other discrete components used to control the timing.

Component 1 …….. [1]

Component 2 …….. [1]

(ii) Capacitor **C1** is potentially hazardous.
Describe **two** precautions that should be taken when selecting and using this component.

1 .....[1]

2 .....[1]

(c) Fig. 9 shows part of the output circuit being tested on a breadboard.
The following **two** connections are missing from the breadboard.

1. **R2** to transistor base connection.
2. Relay coil **X** to transistor collector.

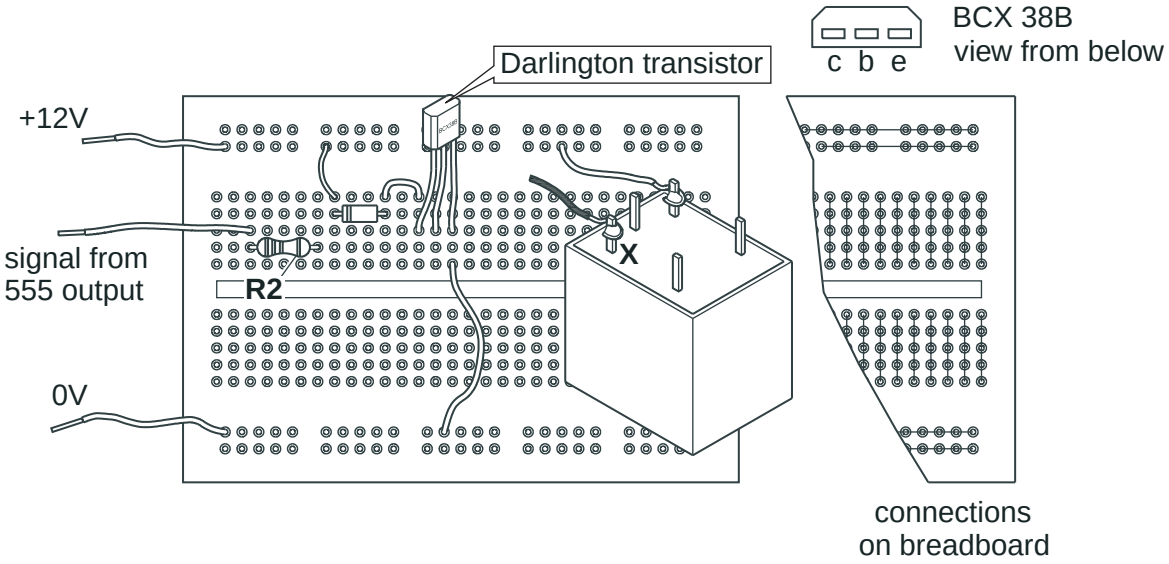


Fig. 9

(i) Draw the **two** connections in the correct position.
Each hole in the breadboard can only be used once. [2]

(ii) The relay being used is described in a catalogue as **12V SPDT**.
Explain the meaning of this description.

.....

.....

.....[2]

[Total: 10]

4 **(a)** PCB layouts are often designed using CAD software.
Part of a layout is shown in Fig. 10.

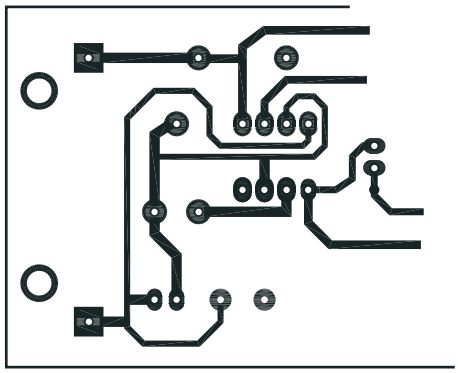


Fig. 10

(i) State **two** features that can be changed without altering the basic layout of the circuit.

1 .....[1]

2 .....[1]

(ii) PCBs will often be designed using an auto-routed layout.
Give **one** important stage in the production of an auto-routed layout.

.....

.....[1]

(iii) Auto-routing will sometimes leave the last part of the circuit to be completed manually.
Fig. 11a shows the position of two unrouted tracks and component outlines.
Complete the layout on Fig. 11b to show a suitable route for each track which uses no links.

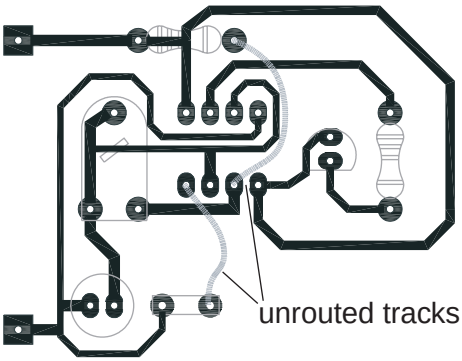


Fig. 11a

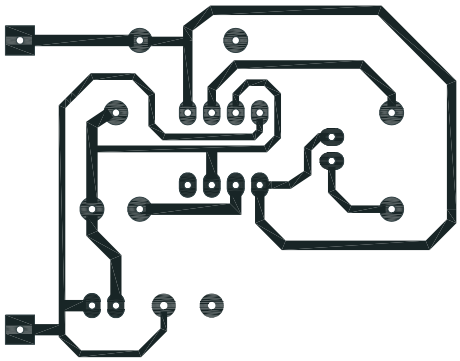


Fig. 11b

[2]

(b) Fig. 12 shows final details added to a board layout before manufacture.

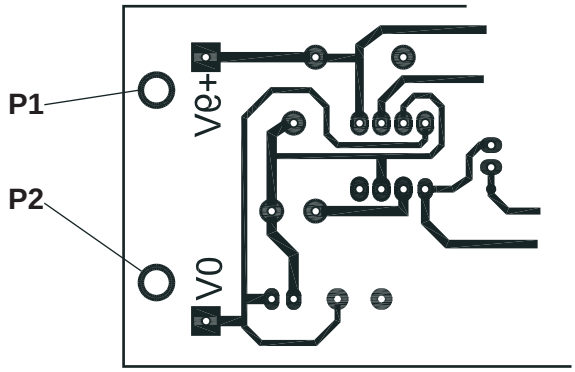


Fig. 12

State the purpose of pads **P1** and **P2**.

.....[1]

(c) Fig. 13 shows a completed block of circuit boards from a commercial manufacturer.

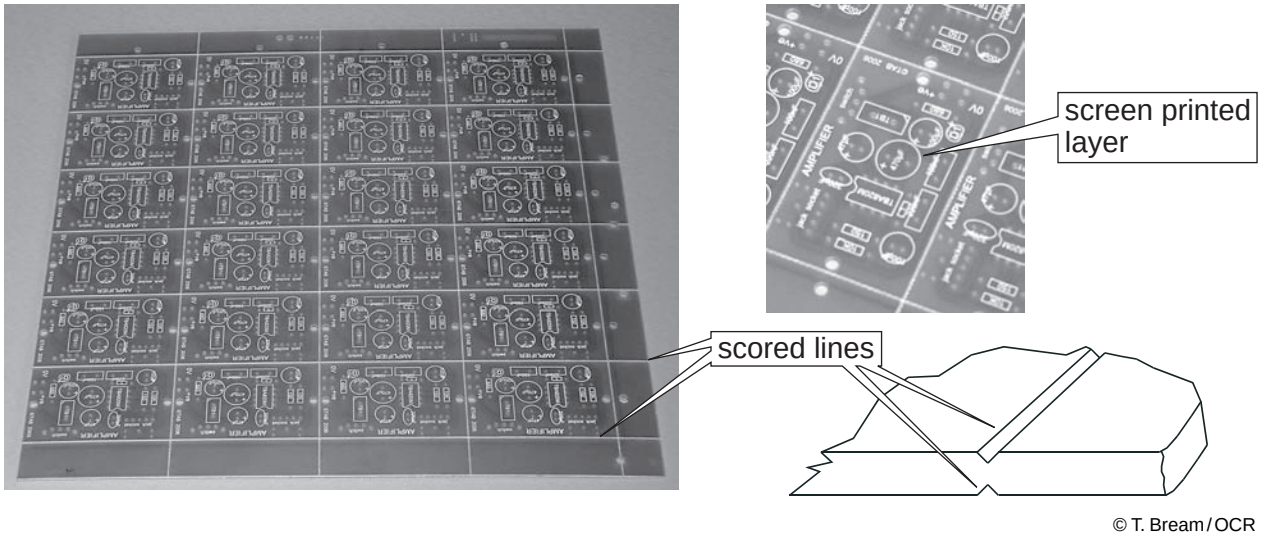


Fig. 13

(i) Give **two** benefits to the manufacturer of blocking circuits.

Benefit 1 .....[1]

Benefit 2 .....[1]

(ii) CAD / CAM equipment is used to provide the two features labelled in Fig. 13.
Give **one** reason for the inclusion of each feature.

Scored lines .....[1]

Screen printed layer .....[1]

[Total: 10]

5 **(a)** Fig. 14 shows a novelty siren for use on a cycle. The siren has eight sounds available which can be selected with a rotary switch. It also has three LEDs which light when the siren is operated.

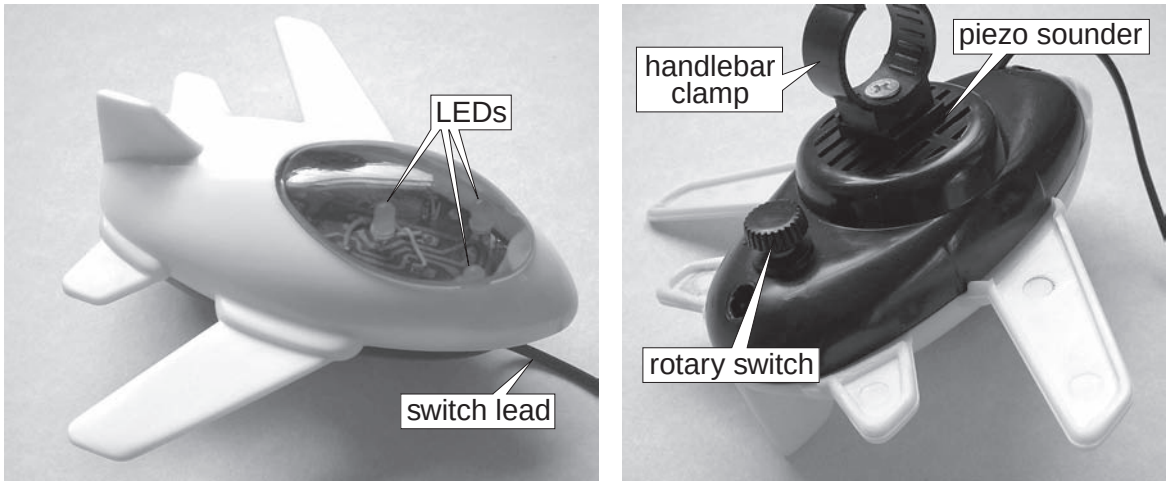


Fig. 14

(i) State the most likely method of manufacture for the plastic casing of the siren.

.....[1]

(ii) Once tools for the casing are prepared for manufacture any changes are likely to be expensive.
Give **one** change that can be made with little cost to the manufacturer.

.....[1]

(b) The circuit board for the siren is shown in Fig. 15.
The circuit uses an IC which is permanently bonded to the PCB, known as Chip on Board (COB) technology.

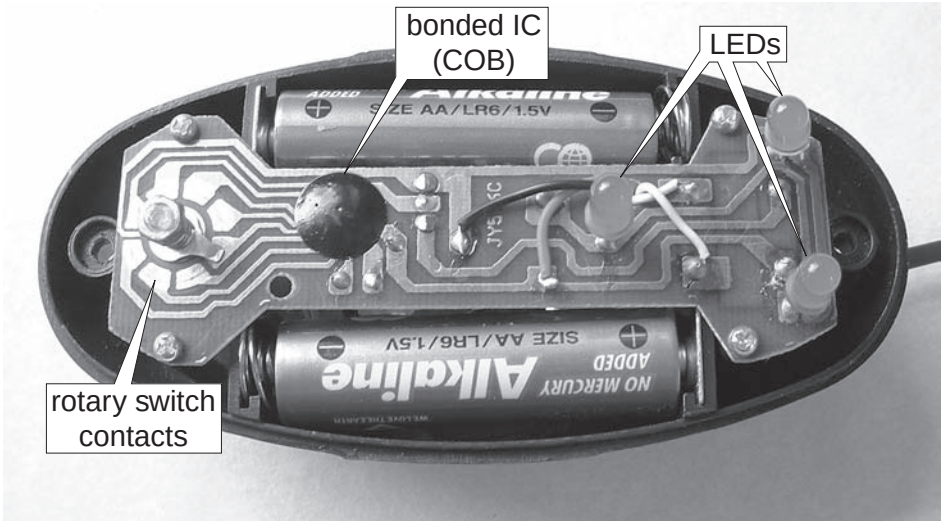


Fig. 15

Give **two** benefits of having a board with the IC permanently bonded to the PCB.

Benefit 1 .....

.....[1]

Benefit 2 .....

.....[1]

(c) The construction of the rotary switch is shown in Fig. 16.

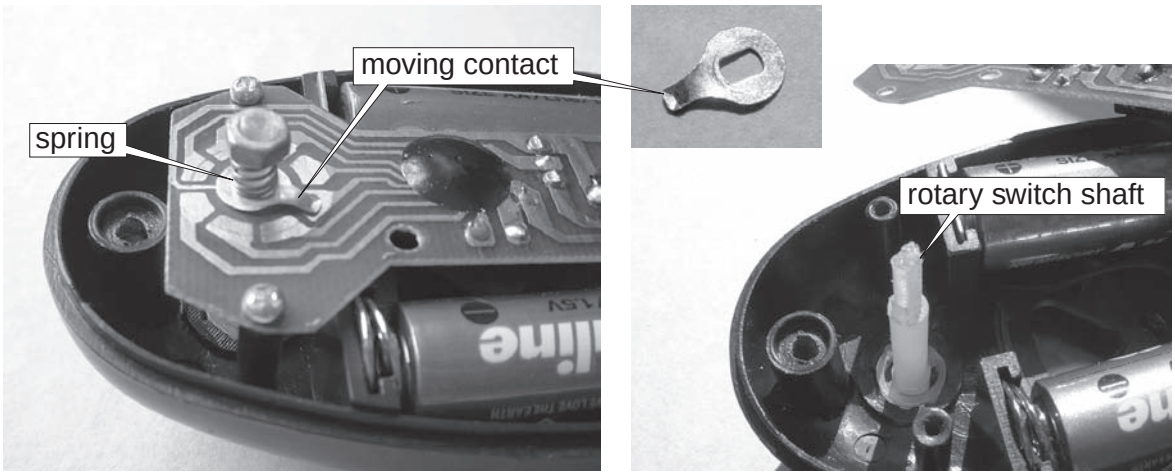


Fig. 16

(i) Describe the purpose of the spring.

.....[1]

(ii) Give the reason for using a shaped mounting hole for the moving contact to locate on the rotary switch shaft.

.....[1]

(d) The novelty siren is a low cost item that is not intended to last for a long time.
Describe **two** ways in which the manufacturer could help to avoid damage to the environment when the product is disposed of.

1 .....

.....[1]

2 .....

.....[1]

(e) The novelty siren is powered by 2 × 1.5V (AA) batteries.
The circuit for the three LEDs is shown in Fig. 17.

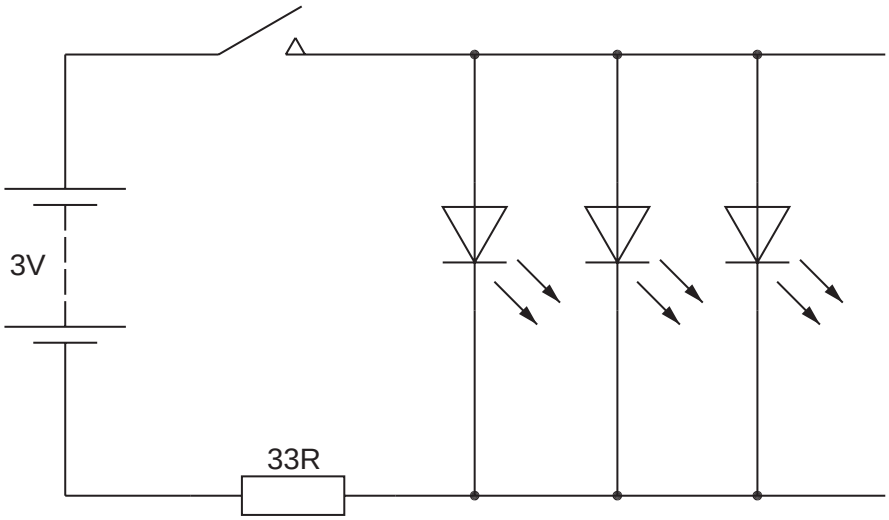


Fig. 17

Calculate the current flow through each LED when the circuit is operated.
Assume a 1.7V drop across an LED.

Use the formula V = I × R.

.....

.....[2]

[Total: 10]