

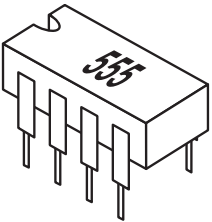
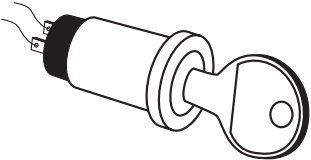
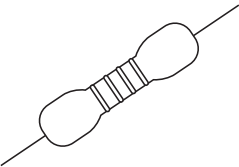
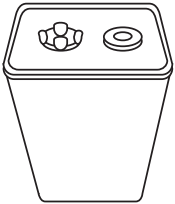
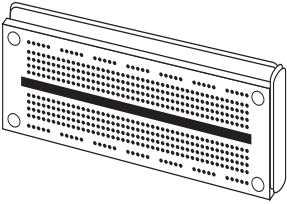
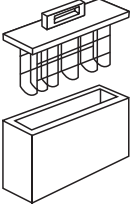
Answer ALL the questions. Write your answers in the spaces provided.

1. The table below shows some components and pieces of equipment.

(a) Complete the table by:

- (i) naming each component or piece of equipment
- (ii) describing its use.

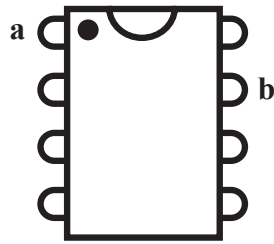
The first one has been done for you.

Component/Equipment	Name	Use
	555 timer IC	Creating timing pulses or time delays
		
		
		
		
		

(10)



(b) The diagram below shows a 555 timer IC.



(i) Give the number of leg 'a'. (1)

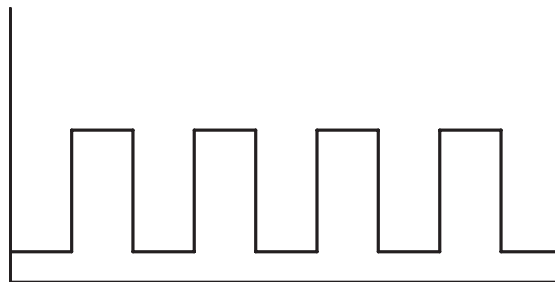
(ii) Give the number of leg 'b'. (1)

(iii) Mark with a cross (☒) which voltage could be used to power a 555 timer IC.

- 0.5 V 5.0 V 50 V (1)

(c) The graph below shows the waveform of a timer circuit.

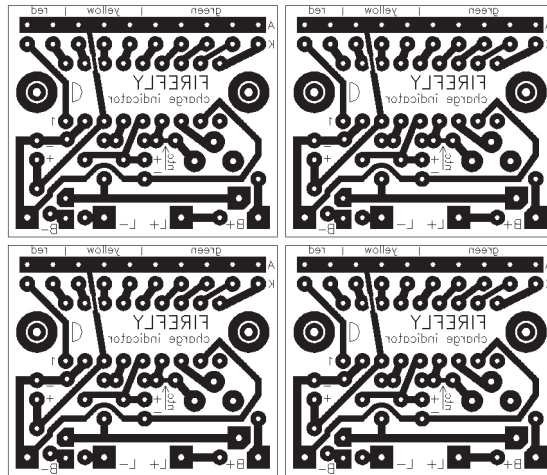
Label the waveform to show the **mark** and the **space**.



(2)



(d) The diagram shows a printed circuit board (PCB) containing several identical circuits.



Give **one** reason why a manufacturer produces more than one identical circuit on a PCB.

.....
.....
(1)

(e) CAD is used to design PCBs.

Explain **two** advantages of using CAD to design PCBs rather than designing on paper.

1
.....
2
.....
(4)

(f) In schools, small components are placed into PCBs by hand.

Describe how components are placed into PCBs in industry other than by hand.

.....
.....
.....
(2)

(Total 22 marks)

Q1



2. A student is planning to make a pocket Lottery Number Generator.

(a) Name **one** suitable electronic component to display numbers from 0 to 9.

.....
(1)

(b) (i) Explain **one** reason why a battery would be a suitable power source for the Lottery Number Generator.

.....
.....
(2)

(ii) Name **two** types of battery that would be suitable for the Lottery Number Generator.

1
2
(2)

(c) The case of the Lottery Number Generator could be vacuum formed from rigid polystyrene sheet.

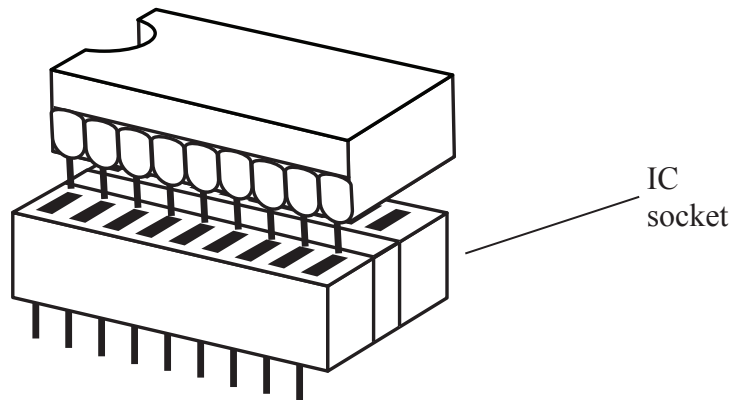
Explain **two** reasons why rigid polystyrene is suitable for the case.

1
.....
2
.....
(4)



(d) The student decides to use IC sockets when assembling the circuit.

Give **two** reasons why IC sockets are often used when assembling circuits.



- 1
.....
 - 2
.....
- (2)**

(e) The student will use a PIC in the Lottery Number Generator circuit.

State **two** benefits of using a PIC.

- 1
.....
 - 2
.....
- (2)**



(f) The PCB is tested using a multimeter before the components are soldered on.

(i) State which setting the multimeter would be set to.

..... (1)

(ii) State **one** fault that this setting would detect.

..... (1)

(iii) State whether the multimeter would show a **high** or **low** resistance. Mark your chosen answer with a cross (☒) .

High resistance **Low resistance** (1)

(g) A manufacturer decides to produce a batch of 500 circuits.

Explain **two** benefits of batch production.

1
.....
2
..... (4)

(h) The case and lid for the circuit could be made either from a single type of plastic, or from two different types of plastic.

Explain **one** environmental advantage of using a single type of plastic.

.....
.....
..... (2)

(Total 22 marks)

Q2

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3. A company is designing a calculator to be used for teaching young children about adding up.

The specification for the calculator case is that it must:

- appeal to young children and be easy to switch on and off
 - have the following easy to use controls: ON & OFF, 0 to 9, +, =
 - have easy access to the batteries
 - be made from materials and processes suitable for batch production.
- (a) In the spaces opposite, use sketches and, where necessary, brief notes to show **two different** design ideas for the calculator case that meet this specification.

Do **not** evaluate your designs in part (a).

Candidates are reminded that if pencil is used for diagrams/sketches, it must be dark (HB or B). Coloured pens, pencils and highlighter pens must **not** be used.

PLEASE DO NOT WRITE OR DRAW IN THIS SPACE.

PLEASE USE THE SPACES OPPOSITE FOR YOUR DESIGNS.



Design Idea 1

(8)

Design Idea 2

(8)



(b) Three of the specification points are given again below.

Evaluate how **one** of your design ideas succeeds or fails to meet each of these specification points.

Write the number of your chosen design idea (1 or 2) here

(i) Appeal to young children and be easy to switch on and off.

.....
.....
.....

(2)

(ii) Have the following easy to use controls: ON & OFF, 0 to 9, +, =.

.....
.....
.....

(2)

(iii) Have easy access to the batteries.

.....
.....
.....

(2)

Q3

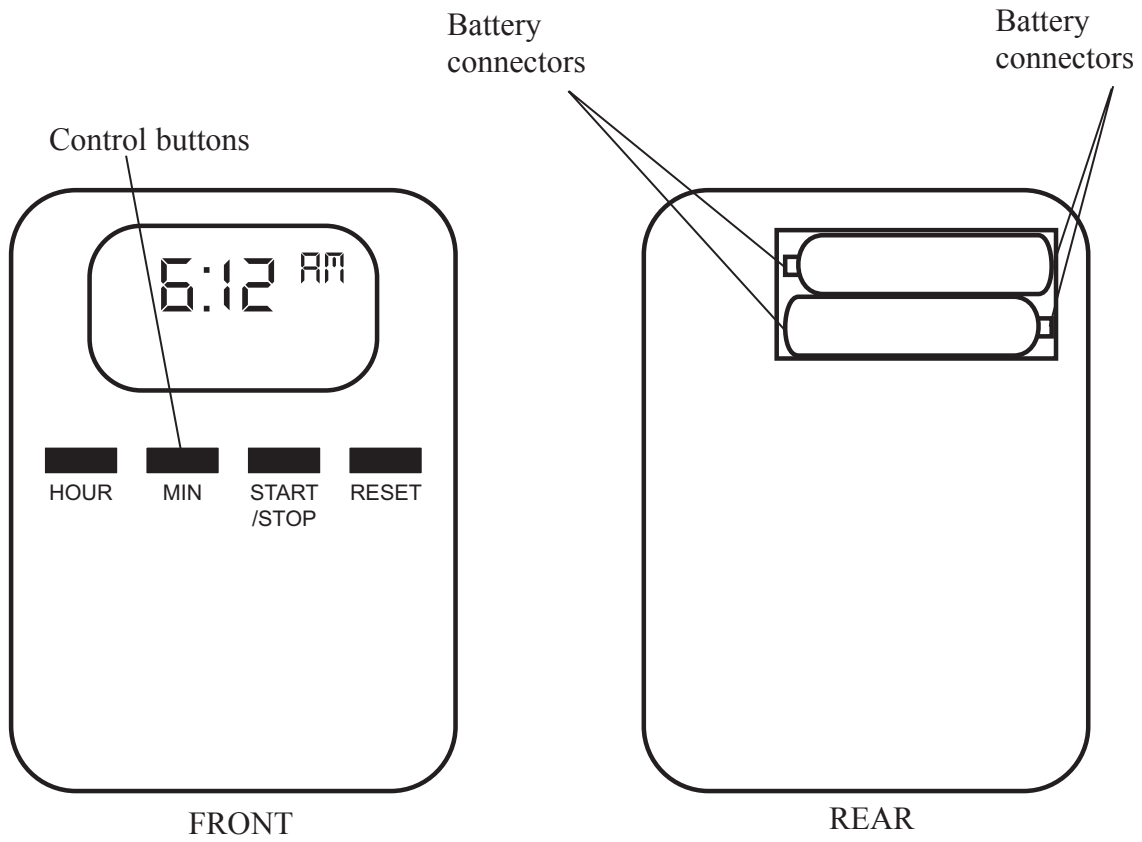
(Total 22 marks)



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4. The diagrams below show a digital timer.



(a) Two specification points for the timer are that it must be:

- easy to adjust the timing settings
- easy to read the display.

Under each of the following headings, give **one** more point that should be included in the specification for the timer.

For each point, give **one** reason why it should be included.

Quality.

Point

Reason

(2)

Environment.

Point

Reason

(2)

Safety.

Point

Reason

(2)



(b) The timer uses a 7-segment display.

One reason why a 7-segment display is used is because it is readily available.

Give **two** other reasons why a 7-segment display is suitable for this timer.

1

2

(2)

(c) The casing of the timer is manufactured using the injection moulding process.

Give **two** reasons why injection moulding is a suitable process for the manufacture of the casing.

1

.....

2

.....

(2)

(d) The casing is assembled using solvent cement.

Explain **one** reason why solvent cement is used for assembling the casing.

.....

.....

.....

(2)



(e) The battery connectors are made from brass.

Give **two** properties of brass that make it a suitable material for the battery terminals.

For each property give **one** reason why brass is suitable.

Property 1

Reason

.....

Property 2

Reason

.....

(4)

(f) The manufacturer of the batteries uses sampling during production.

Explain **one** reason for sampling during the manufacture of the batteries.

.....

.....

.....

(2)



(g) Two specification points for the timer are that it must be:

- easy to adjust the timing settings
- easy to read the display.

Explain, under the following headings, how the timer satisfies these specification points.

(i) Easy to adjust the timing settings.

.....
.....
.....
.....

(2)

(ii) Easy to read the display.

.....
.....
.....
.....

(2)

Q4

(Total 22 marks)

TOTAL FOR PAPER: 88 MARKS

END

