



GCSE

3601U10-1

WEDNESDAY, 15 JUNE 2022 – AFTERNOON

DESIGN AND TECHNOLOGY

UNIT 1

ENGINEERING DESIGN

2 hours plus your additional time allowance

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 0 _____

For Examiner's use only

Question	Maximum Mark	Mark Awarded
1.	10	
2.	10	
3.	15	
4.	20	
5.	20	
6.	25	
Total	100	

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

(Turn over)

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part question. You are advised to divide your time accordingly.

The total number of marks available is 100.

You are reminded of the need for good English and orderly, clear presentation in your answers. The quality of your written communication, including appropriate use of punctuation and grammar, will be assessed in your answer to question 4(c).



Answer ALL questions.

1. Study the photos opposite. The glass bottles have been recycled to become roof insulation.

(a) Explain an environmental advantage of recycling the glass bottles into roof insulation. [2 marks]



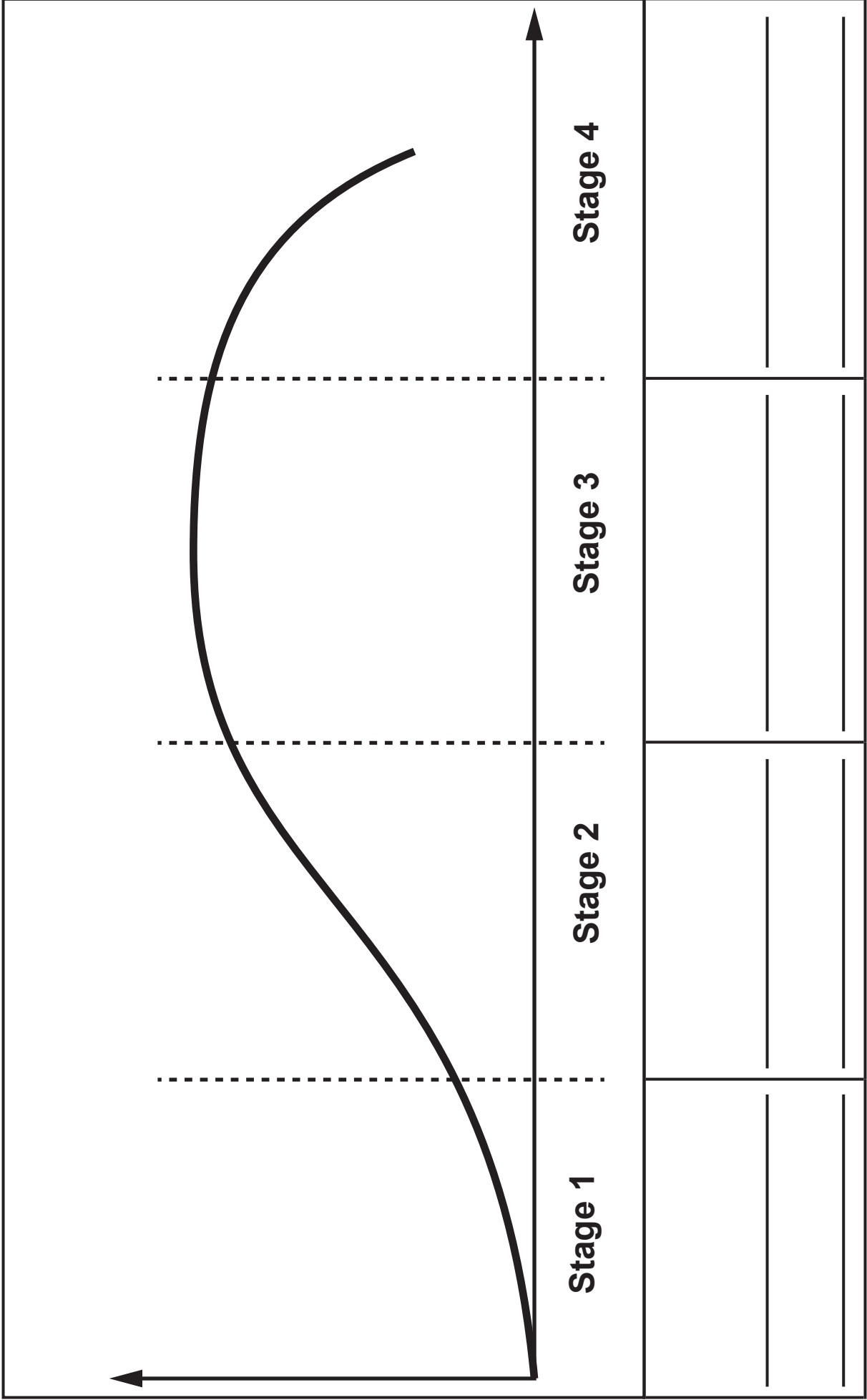
1 (b) A laptop computer (pictured opposite) has an aluminium case. The raw aluminium ore is sourced from South America, then processed and manufactured in China to be sold in the United Kingdom (UK).

(i) Describe one benefit this has for UK consumers.

[2 marks]

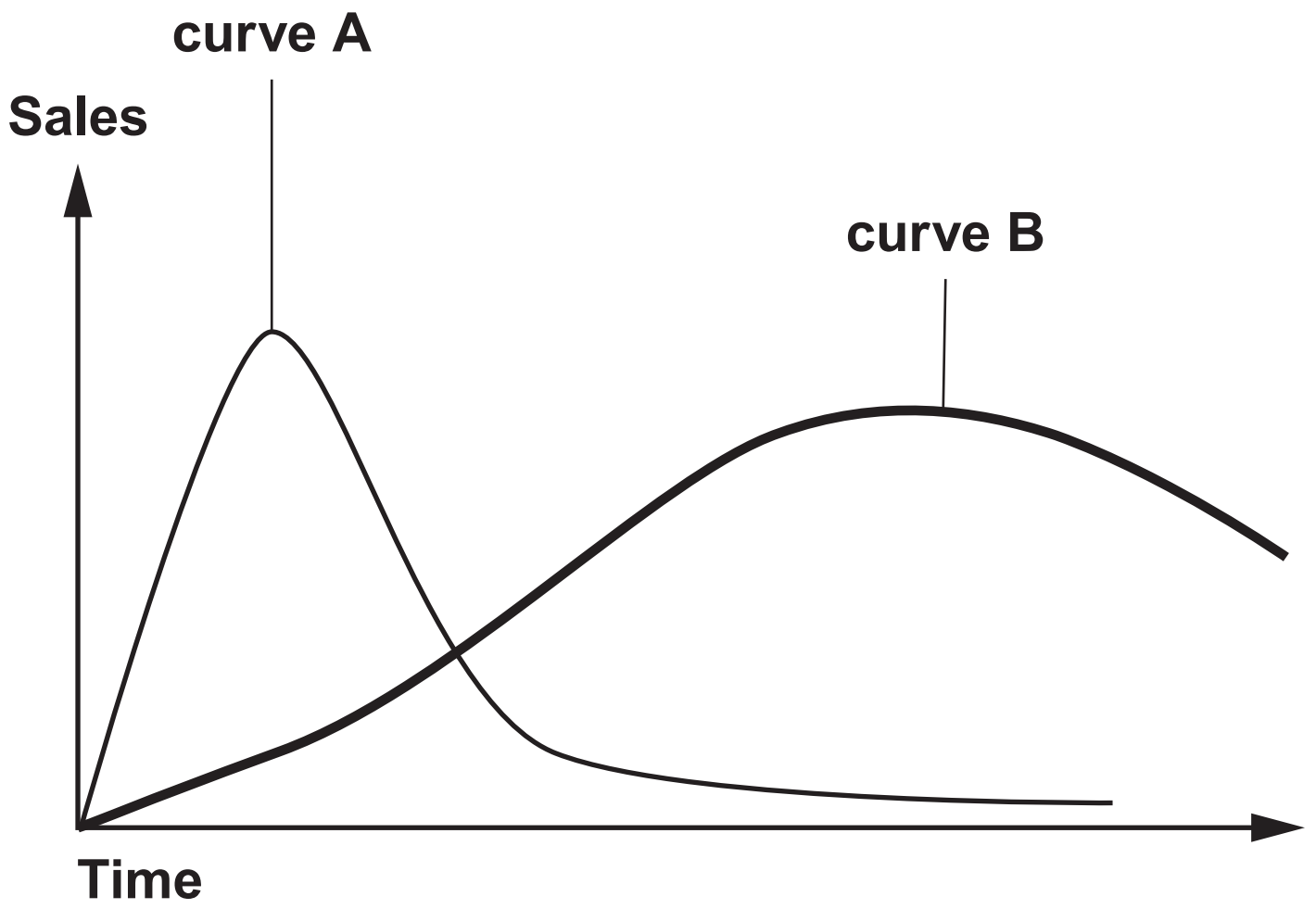
1 (b) (ii)

Describe why the laptop has a high carbon footprint. [2 marks]



2. The graph opposite shows a product life cycle.



(a) Label the FOUR stages of a product life cycle in the table opposite. [4 × 1 mark]



2 (b) The graph opposite shows the product life cycle for two different products.

Match the curve to the appropriate product by writing **A** or **B** in the correct box below.

[2 marks]

	
<p>Fidget spinner matches curve _____</p>	<p>Smart watch matches curve _____</p>

(Turn over)

**ENERGY
SOURCE**

**RENEWABLE/
NON-RENEWABLE**

Coal



Nuclear



Solar



Wind



3. The images opposite show different energy sources.
- (a) Complete the table opposite by stating whether the energy source is renewable or non-renewable.
[4 × 1 mark]

3 (b) Describe ONE advantage for EACH energy source.
4 × [2 marks]

ENERGY SOURCE	ADVANTAGE
Coal	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
Nuclear	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

(Turn over)

3 (b)

ENERGY SOURCE	ADVANTAGE
Solar	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
Wind	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

(Turn over)

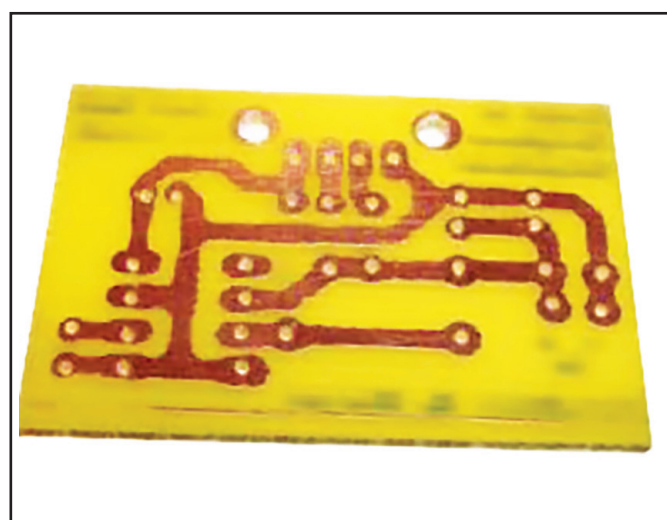
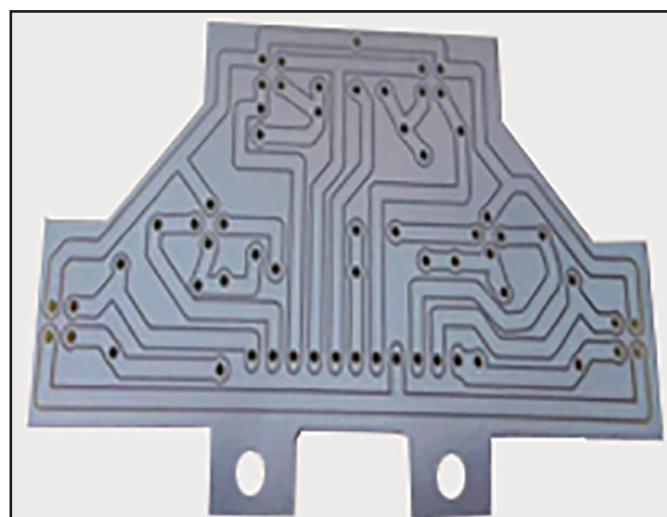
4. Apple is a leading technology company. Apple regularly uses aluminium for the case or body on its products.

(a) Describe TWO properties of aluminium that make it suitable for the body or casing of Apple products. [2 × 2 marks]

Property 1:

Property 2:





5 (b) Study the two images of prototype printed circuit boards (PCBs) shown opposite.

(i) Describe why copper is used for the solder side of the PCB. [2 marks]

5 (b) (ii)

Name a suitable material for the component side of the PCB and discuss a physical property that makes it appropriate.

Name of material: [1 mark]

Physical property: [2 marks]



Infrared Sensor



6. An automatic door system is shown opposite. A programmable control system operates the door. The system has an **INFRARED SENSOR** which senses a person's body heat. The **INFRARED SENSOR** is 'on' when a person stands in front of it. The **INFRARED SENSOR** is 'off' when no one is in front of the sensor.

(a) (i) Explain why a flowchart could be used when programming the control system. [2 marks]

6 (a) (ii)

Explain ONE advantage of using a macro or subroutine when programming. [2 marks]

6 (a) (iii)

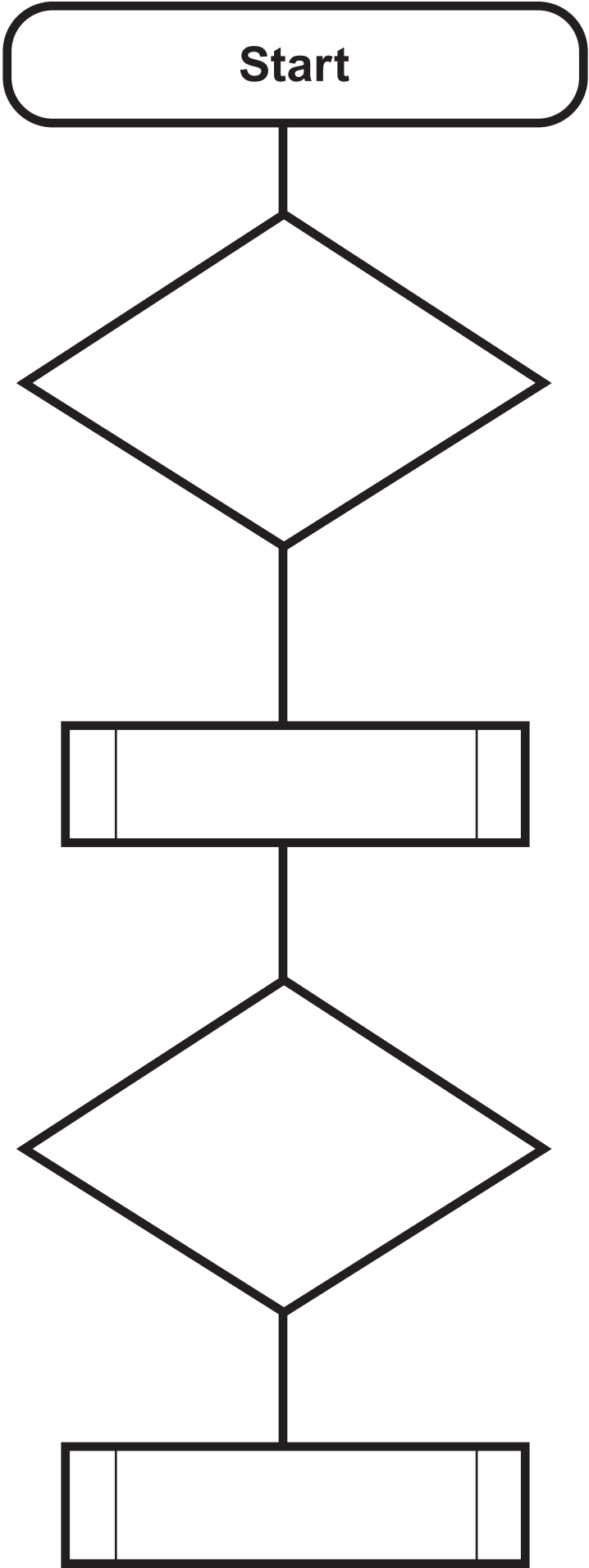
Draw a block diagram for the automatic door system in the space below. [4 marks]

A large empty rectangular box with a black border, intended for drawing a block diagram of an automatic door system.

(Turn over)

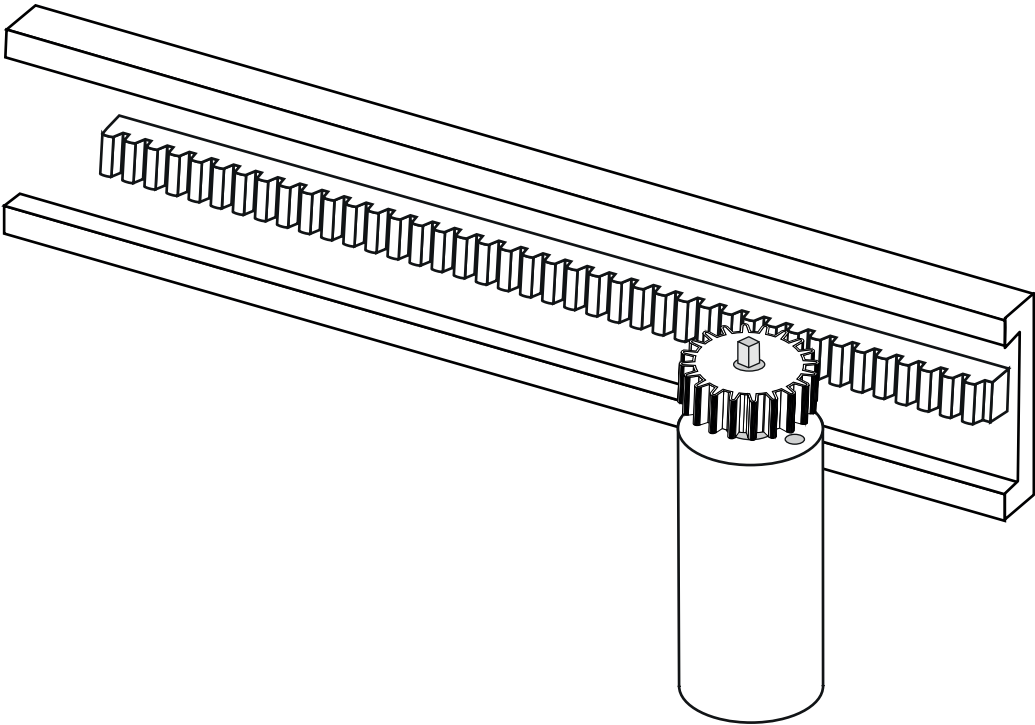
6 (a) (iv)

Explain why a designer or engineer might use a block diagram. [2 marks]



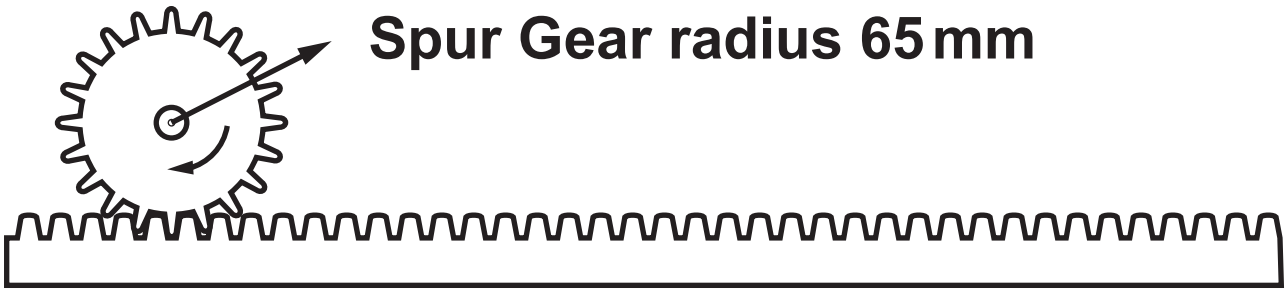
- 6 (b) Complete the flowchart for the automatic door opposite by adding the correct statements and missing feedback loops. [9 marks]**

Note: do not write the subroutines themselves.



6 (c) The mechanical system used in the automatic door is shown opposite.

(i) State the correct name of the gear system shown above. [1 mark]



Spur Gear radius 65 mm

6 (c) (iii)

The table below shows a parts list for the automatic door.

Calculate the total cost and the total inclusive of 20% VAT. [2 marks]

Part	Unit cost (£)	Number required	Cost (£)
Motor	£100	2	_____
Infrared sensor	£150	2	_____
Gears	£40	2	_____
Control system	£200	1	_____
Total cost (£)			_____
Total cost (£) inclusive of 20% VAT			_____

END OF PAPER

(Turn over)

