Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

General Certificate of Secondary Education
June 2011

Engineering 48501

Unit 1 Written Paper

Monday 16 May 2011 1.30 pm to 2.30 pm

For this paper you must have:
- normal writing and drawing instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the space provided.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

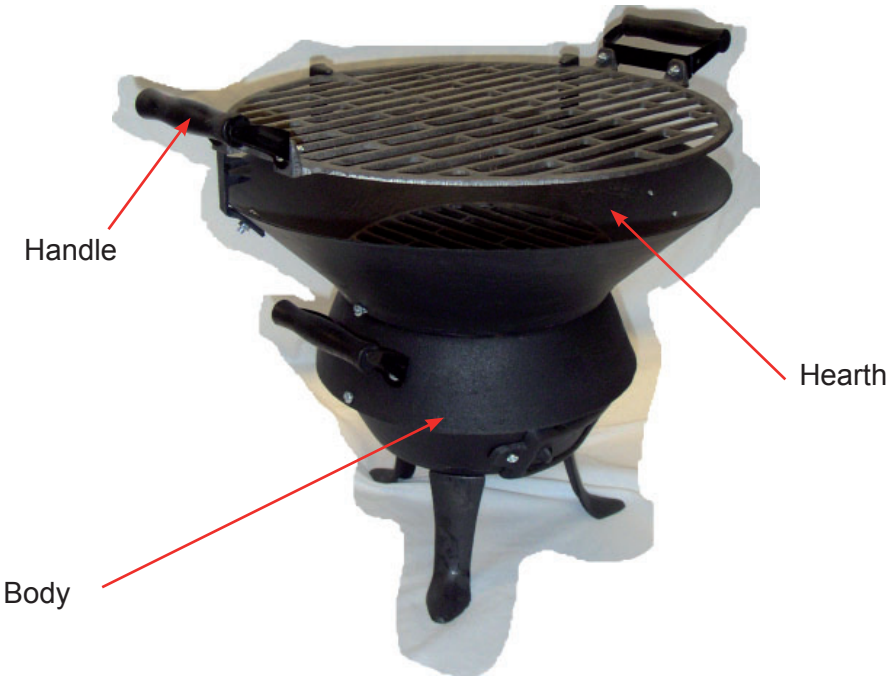
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.
- The questions in Section A relates to the context referred to in the preliminary materials that were previously issued.
- You are reminded of the need for good English and clear presentation in your answers. Quality of Written Communication will be assessed in Question 1(c).

Section A

Answer **all** questions in this section.

1 A picture of a 'hibachi' or 'fire-pot' style of barbecue is shown in **Figure 1**.

Figure 1



1 (a) In the spaces below, correctly describe the *function* of each labelled part.

Hearth .....

.....

.....

.....

Handle .....

.....

.....

.....

Body.....

.....

.....

.....

(6 marks)

1 (b) Look at **Figure 1** opposite. Identify the manufacturing method used for the body of the barbecue **and** name a material suitable for that process.

1 (b) (i) Manufacturing method .....

.....

Material.....

.....

(2 marks)

1 (b) (ii) Explain why the properties of the material used to form the body of the barbecue are suitable.

.....

.....

.....

.....

(2 marks)

1 (b) (iii) Identify and explain **one** disadvantage of this design of barbecue for the user **and** suggest a solution.

Disadvantage .....

.....

Solution .....

.....

.....

.....

(3 marks)

1 (c) The charcoal burning barbecue shown in **Figure 1** needs to be stable when in use. In the space below:

- identify the strengths and weaknesses in the stability of this design
- suggest possible improvements to the design of the barbecue.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

1 (d) The heat of the fire in **Figure 1** is adjusted by allowing more or less air to reach the fire. Such a system is known as a *damper*.

Using notes and sketches in the space below, describe **one** way the heat output of the fire can be adjusted.

(5 marks)

22

2 Modern barbecues are designed to be easy and safe to use.

Figure 2

2 (a) Look at **Figure 2** above. In the spaces below, identify **and** explain the following.

one feature which makes it easy to use

.....

.....

explanation .....

.....

.....

.....

one safety feature .....

.....

explanation .....

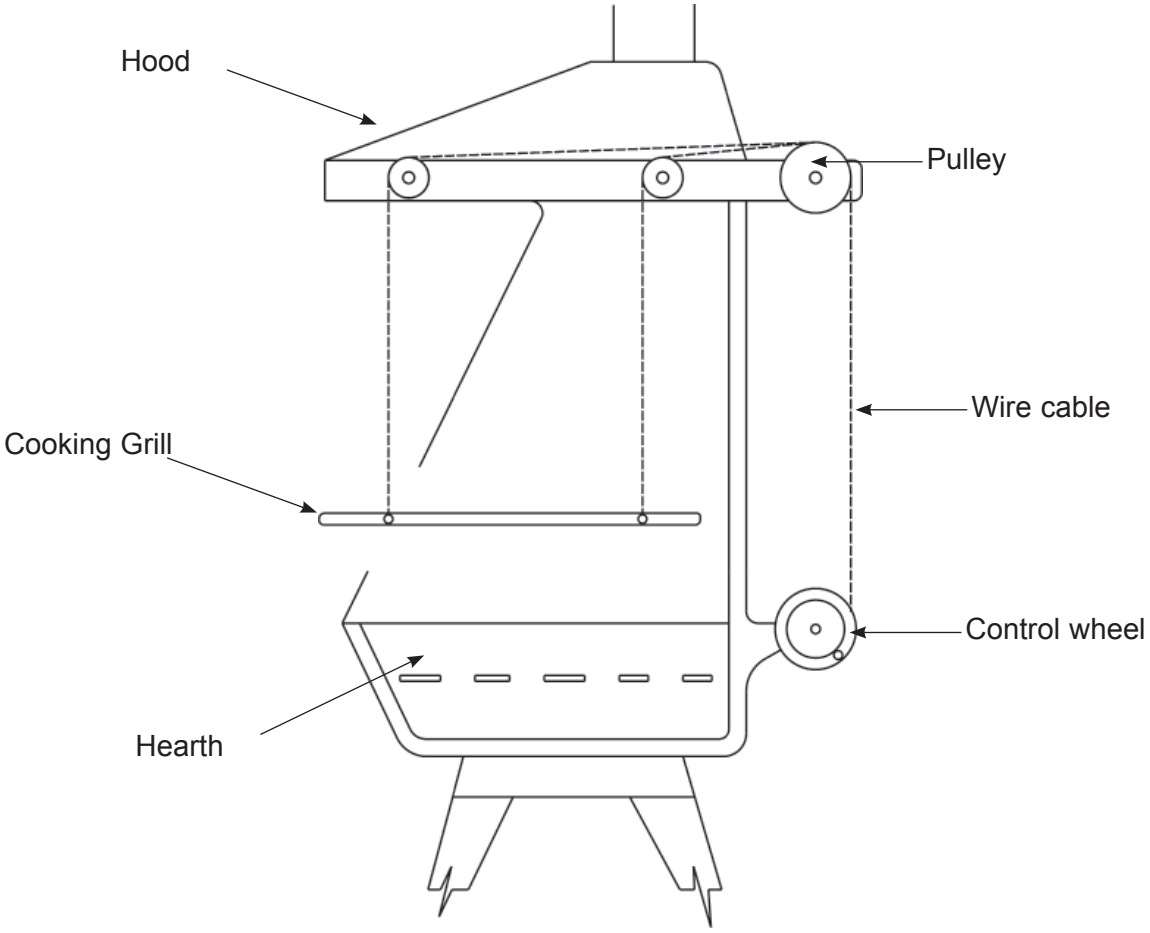
.....

.....

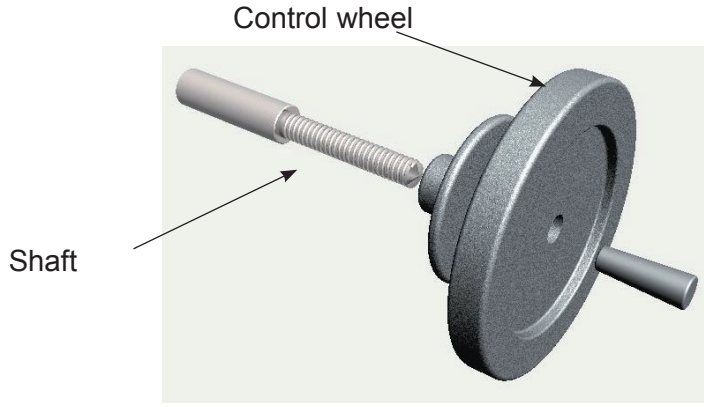
.....

(6 marks)

2 (b) The drawing below shows a diagrammatic view of a restaurant barbecue.
The cooking grill is suspended on wire cables and pulleys. This allows the grill to be accurately raised and lowered by turning the control wheel.

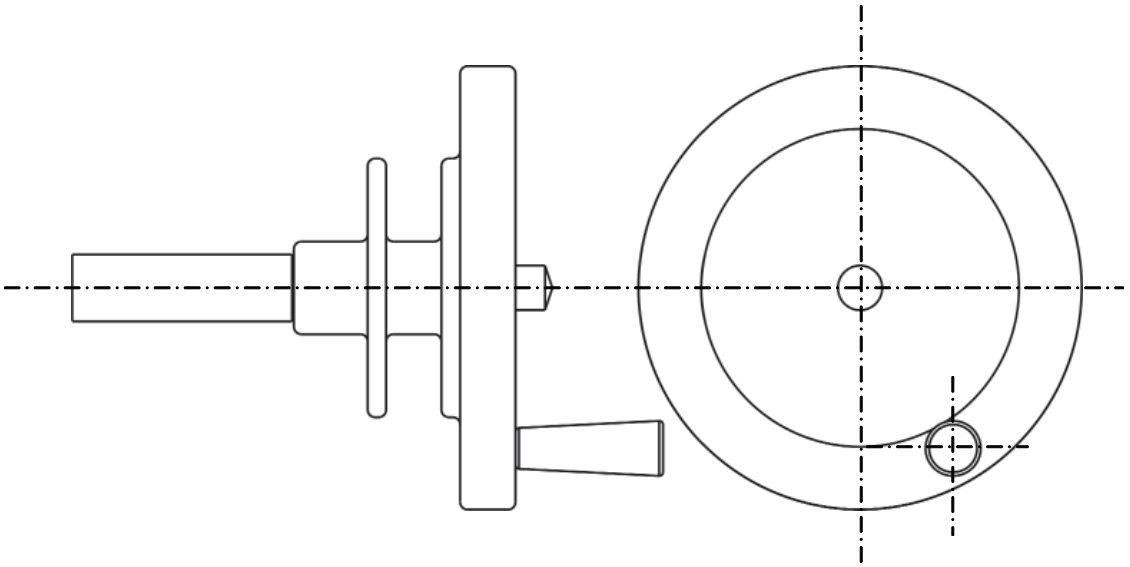


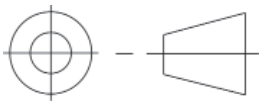
An exploded view of the control wheel and its shaft



Question 2(b) continues on the next page

2 (b) Using notes and sketches, adapt the drawings below to show how the control wheel can be securely attached to the given shaft.





(5 marks)

11

Section B

Answer **all** the questions in this section.

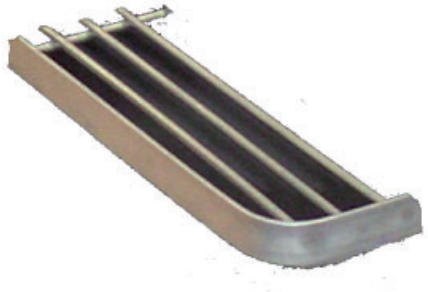
3 **Figure 3** shows a modern charcoal-fired barbecue, fabricated from mild (low carbon) steel.

Study **Figure 3** to answer the questions which follow.

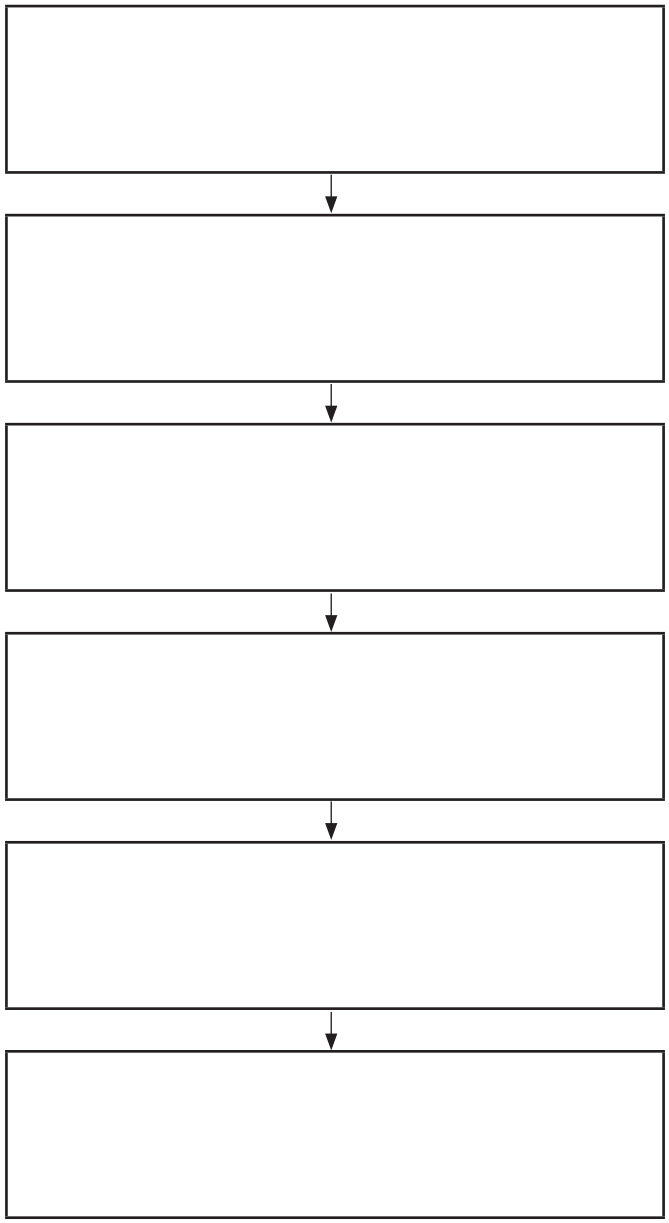
Figure 3

Question 3 continues on the next page

3 (a) A small section of the cooking grill labelled **X** in **Figure 3** is shown below.



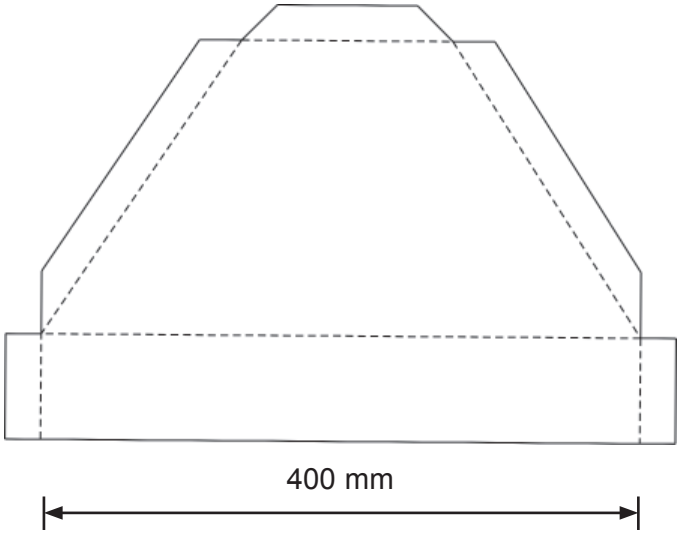
In the boxes below, identify the different processes used to manufacture the grill.



(6 marks)

3 (b) The hearth of the barbecue shown in **Figure 3** is made from 2 mm mild steel (low carbon) sheet, which has been cut to shape, bent and joined.

One quarter of the 'development or net' of the hearth is shown below.



3 (b) (i) Describe a suitable process of marking out this net accurately on steel sheet.

.....

.....

.....

.....

(2 marks)

3 (b) (ii) Explain in detail how the part would be accurately cut out.

.....

.....

.....

.....

(2 marks)

Question 3 continues on the next page

3 (b) (iii) Identify a suitable method of making the folds in the cut-out 'net' **and** explain how it is done.

Method .....

.....

Explanation .....

.....

.....

.....

(3 marks)

3 (c) Describe a *fastening system* capable of joining mild steel (low carbon) sheet, to create a heat proof joint.

Fastening system.....

.....

.....

.....

(2 marks)

15

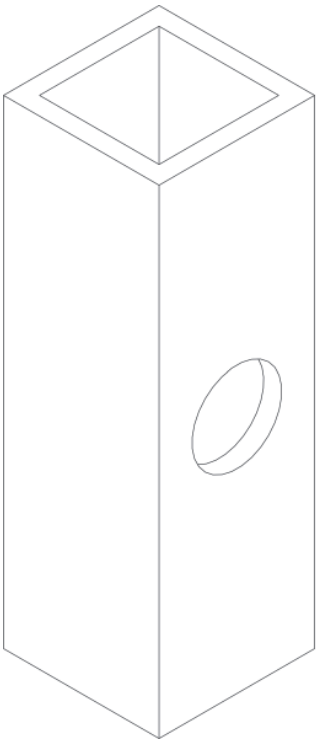
Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

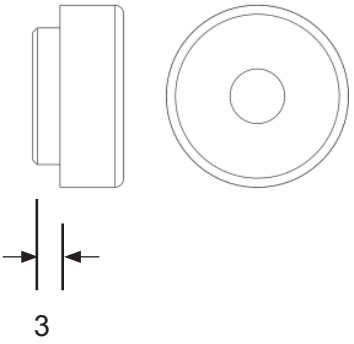
4 **Figure 4** shows a Parts Drawing of a simple clamp body made from square mild steel (low carbon) tube, with a turned mild steel boss fitted to one side. The hole through the boss has been drilled to accept an M8 screw thread.

Figure 4

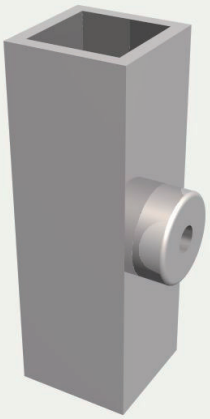
Mild steel tube: 25 mm square.
Wall thickness: 3 mm.
Hole drilled in one side at 15 mm dia. to accept the turned mild steel boss.
Overall height: 80 mm.



Mild steel boss turned to fit the hole in the square tube.

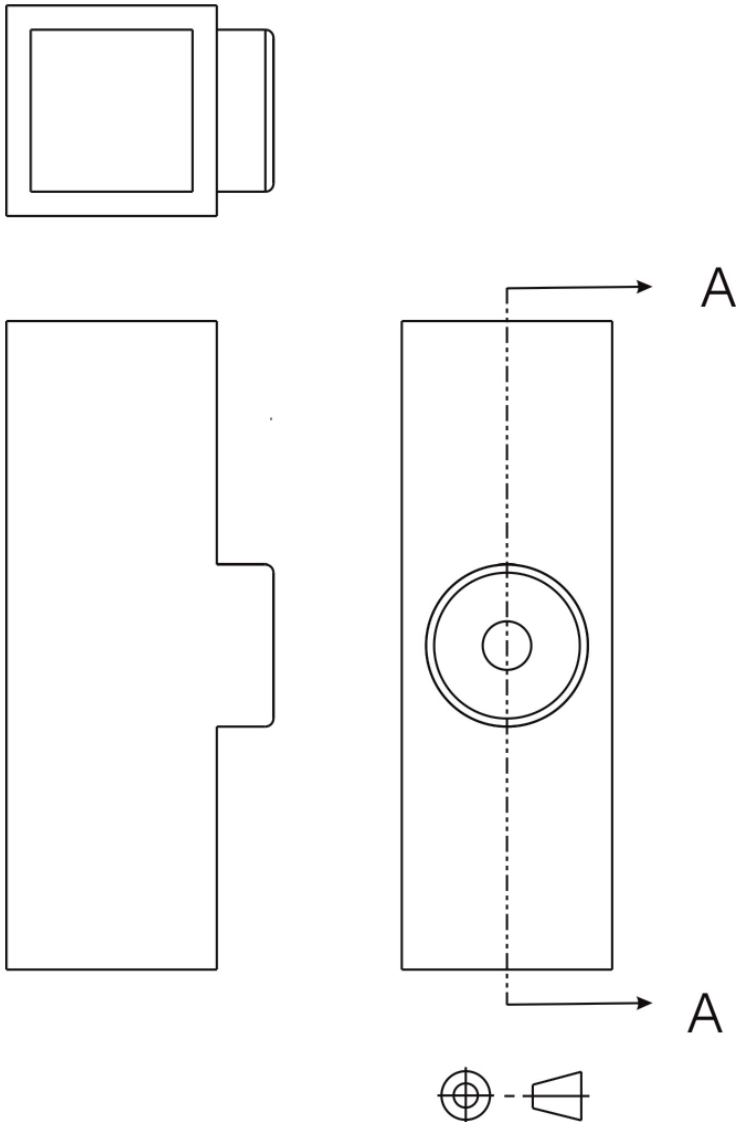


Assembled clamp body



4 (a) Using the information given in **Figure 4**, complete the given diagram in **Figure 5** by drawing a sectioned view on 'AA' **and** adding two major dimensions to a suitable convention. Show the hole through the boss with an M8 screw thread, using the correct convention.

Figure 5



Not to scale

(5 marks)

4 (b) In the table below, create a Production Plan listing **five** major operations needed to hard solder the clamp body. Some parts have been done for you.

Order	Operation	Tools / Equipment	Description
1	Flux the joint area		
2	Fit parts together		
3	Apply hard solder alloy		
4	Heat the joint		
5	Clean finished joint		

Use the information below to complete the table by inserting the *code letter* (A to J) in the appropriate space above.

Insert boss step into the hole in the square tube. (F)

Snips / Pliers
Brazing rod
Tweezers (A)

Heat the clamp gently to dry the flux, then more vigorously to melt the rod so that it flows around the joint. (B)

Hands and fingers (H)

Borax / Sifbronze
Water
Brush and bowl (E)

Hand file
Emery cloth (G)

Blow torch
Welding torch
Brazing hearth (D)

Remove excess melted flux and remove oxide layer produced by heating. (I)

Mix into a thin paste and apply to both parts. (C)

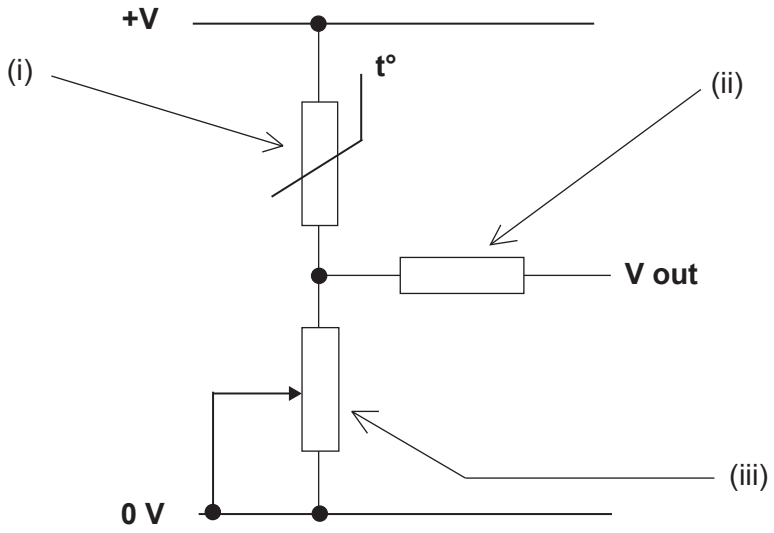
Cut and position a small piece of rod touching both parts of the clamp body. (J)

(10 marks)

15

5 A 'meat thermometer' has a sensor mounted at the end of a pointed probe, which is plunged into meat to measure its internal temperature.

5 (a) Shown below is a circuit diagram of a potential divider, configured to act as a heat sensor. Correctly identify the **three** electronic components labelled.



5 (a) (i) .....

(1 mark)

5 (a) (ii) .....

(1 mark)

5 (a) (iii) .....

(1 mark)

5 (b) Identify a suitable output device for the thermometer **and** explain how it would indicate that the meat is at the right temperature.

Output device .....

.....

Explanation .....

.....

.....

.....

(3 marks)

6

Turn over ▶

6 The use of modern technology has led to great changes in the way a product is engineered.

For any engineered product you are familiar with, identify **two** stages of its production **and** for each explain the changes that the use of modern technology has made.

Answer in the spaces below.

Stage of production 1 .....

.....

Explanation 1 .....

.....

.....

.....

Stage of production 2 .....

.....

Explanation 2 .....

.....

.....

.....

(6 marks)

6

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED