Please write clearly, in block capitals.
$\square$ Candidate number $\square$

Surname
Forename(s)
Candidate signature $\qquad$

## A-LEVEL

DESIGN AND TECHNOLOGY PRODUCT DESIGN

## Paper 2 Designing and Making Principles

## Additional specimen

Morning Time allowed: 1 hour 30 minutes

## Materials

You must have:

- normal writing and drawing instruments
- a scientific calculator


## Instructions

- Use black ink or black ball-point pen. Use pencil only for drawing.
- Answer all questions.
- You must answer the questions in the spaces provided
- 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 total number of marks available for this paper is 80 .


## Section A

Answer all questions in the spaces provided.

| 0 | 1 | 1 | Figure 1 shows a 2010s modern cordless kettle. |
| :--- | :--- | :--- | :--- |

Figure 2 and Figure 3 show a 1980s kettle.
Compare the two kettles shown.
In your answer you should refer to:

- Product safety
- Energy efficiency
- Ergonomics

Figure 1


Figure 2


Figure 3


|  | Modern kettle | 1980s kettle |
| :--- | :--- | :--- |
| Material | ABS | Stainless steel with a <br> polymer handle. |
| Power supply | Detachable base unit | Plug in power cord |
| Method of filling | Hinged lid | Removable lid |
| Heating element | Flat hot plate | Heating filament |


| $\mathbf{0}$ | $\mathbf{1} .2$ | Analyse and evaluate the impact of a circular economy on the design and |
| :--- | :--- | :--- | manufacture of kettles.

$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ $\longrightarrow$
$\qquad$
$\qquad$
$\qquad$ $\longrightarrow$
$\qquad$
$\qquad$ $\longrightarrow$
$\qquad$
$\qquad$

| $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{3}$ Explain different methods of testing that would have been used before the 2010s |
| :--- | :--- | :--- | :--- | modern cordless kettle (Figure 1) was made available for sale to the public.


| $\mathbf{0}$ | $\mathbf{1}$. | $\mathbf{4}$ Describe the stages of a product life cycle in relation to a modern kettle. |
| :--- | :--- | :--- | :--- |

$\qquad$
$\qquad$ (
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ $\longrightarrow$
$\qquad$ $\longrightarrow$
$\qquad$
$\qquad$
$\qquad$

End of Section A

## Section B

## Commercial Manufacture

Answer all questions in the spaces provided.

Analyse and evaluate how well the tea infuser follows the principles and ethos of the Bauhaus Design School.

Figure 4


Turn over for the next question

| $\mathbf{0}$ | $\mathbf{2}$. | $\mathbf{2}$ The volume of a sphere is $4 / 3 \pi r^{3}$ |
| :--- | :--- | :--- | :--- |

Figure 5 shows a side view of the hemispherical base and cylindrical top section of Marianne Brandt's tea infuser.

Calculate the total volume of these parts of the tea infuser.

Figure 5


| 0 | 3 | $E x p l a i n ~ h o w ~ d i f f e r e n t ~ m o d e l l i n g ~ t e c h n i q u e s ~ c a n ~ b e ~ u s e d ~ i n ~ t h e ~ d e v e l o p m e n t ~ o f ~$ |
| :--- | :--- | :--- | design proposals for a product.

[9 marks]
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ $\longrightarrow$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ [__
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

| $\mathbf{0}$ | $\mathbf{4}$. | $\mathbf{1}$ Figure 6 shows a standing workstation. The ideal height for the desk top is level |
| :--- | :--- | :--- | :--- | with the elbow height of the user as shown in Figure 7.

Calculate the range of height adjustment required to accommodate the $15^{\text {th }}$ to $85^{\text {th }}$ percentiles of the sample shown in Table 1.

Figure 6


Figure 7

## CORRECT STANDING POSTURE



Table 1 shows the ideal elbow height from a range of users.

| Standing elbow height | Number in sample |
| :---: | :---: |
| 937 | 5 |
| 962 | 12 |
| 987 | 17 |
| 1012 | 23 |
| 1037 | 30 |
| 1062 | 38 |
| 1087 | 32 |
| 1112 | 26 |
| 1137 | 19 |
| 1162 | 14 |
| 1187 | 4 |


| $\mathbf{0}$ | $\mathbf{4}$. | $\mathbf{2}$ Discuss specific pieces of anthropometric data that would be used when designing |
| :--- | :--- | :--- | :--- | adjustment controls for the standing workstation.

$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

| 0 | 5 |
| :--- | :--- | development of the shopping trolley shown in Figure 8 and Figure 9.

Figure 8


Figure 9


| 0 | 6 |
| :--- | :--- | Analyse and evaluate the impact of die casting on the environment.

$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ 1

## Turn over for the next question

| $\mathbf{0}$ | $\mathbf{7}$ | List the stages of six sigma. Stage 1 has been completed for you. |
| :--- | :--- | :--- |

Stage 1: Define the issue with the process

## Stage 2:

## Stage 3:

## Stage 4:

## Stage 5:

| $\mathbf{0}$ | $\mathbf{8}$ Give three reasons why consumers may look for the FSC logo on products they |
| :--- | :--- | :--- | purchase.

$\qquad$
$\qquad$
$\qquad$
$\qquad$ (
$\qquad$
$\qquad$
$\qquad$
$\qquad$

Table 2 shows the results from a focus group on a new toothbrush design.
Using this data, calculate the maximum and minimum percentages of 20-29 year olds that could have thought the toothbrush was

- good value for money
and
- cleaned effectively.

Show your working.
[4 marks]
Table 2

|  | Is the toothbrush good <br> value for money? |  | Does the toothbrush <br> clean effectively? |  |
| :--- | :---: | :---: | :---: | :---: |
|  | Yes | No | Yes | No |
| Male 20-29 | 10 | 6 | 12 | 4 |
| Males 30-39 | 8 | 8 | 10 | 6 |
| Males 40+ | 4 | 12 | 11 | 5 |
| Females 20-29 | 15 | 5 | 17 | 3 |
| Females 30-39 | 9 | 7 | 10 | 6 |
| Females 40+ | 12 | 6 | 13 | 5 |

Maximum:
Minimum:

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE ANSWER IN THE SPACES PROVIDED

Acknowledgement of copyright holders and publishers
Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright holders have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements in future papers if notified.
Copyright © 2019 AQA and its licensors. All rights reserved.

