AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

A-level
DESIGN AND TECHNOLOGY: PRODUCT DESIGN

Paper 2 Designing and Making Principles

Friday 14 June 2019 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper 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.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- 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 80.
- There are 30 marks in **Section A** and 50 marks in **Section B**.

For Examiner's Use	
Question	Mark
1	
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9	
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12	
13	
14	
15	
TOTAL	

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Section A – Product Analysis

Answer **all** questions in this section.

0 1 **Figures 1** and **2** show two power drills.

Figure 1

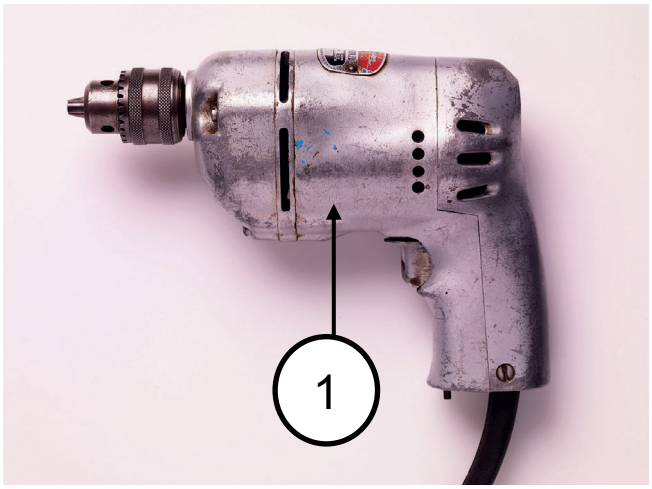

Figure 2

	Figure 1 **Die cast mains powered drill**	**Figure 2** **Injection moulded cordless drill**
Casing material	Die cast aluminium	Injection moulded ABS
Power supply	230 V mains power	9.6 V rechargeable battery pack
Chuck operation	Chuck key	Keyless chuck
Casing joined by	Flat head screws	Security fasteners
Centre of mass	Labelled 1	Labelled 2

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Compare the two drills shown. In your answer you should refer to:

- ergonomic factors
- design safety.

[12 marks]

Do not write outside the box

12

0 2 Evaluate the impact of the Waste Electrical and Electronic Equipment (WEEE) Directive on manufacturers of portable electronic hand tools.

[6 marks]

6

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0 3 Explain **four** ways that cordless power tools can be designed to be disassembled.

[4 × 2 marks]

1 _____

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4 _____

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8

Turn over for the next question

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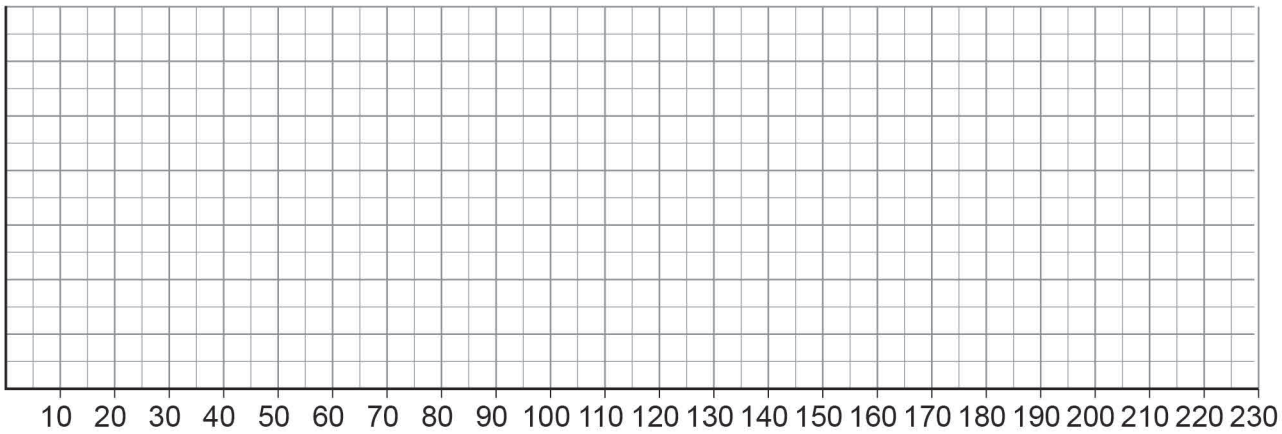
0 4 The battery life of a rechargeable battery was tested in a handheld electronic device. The test was repeated 11 times with a new battery each time.

The results are shown in the table below.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Battery life (in minutes)	65	110	180	130	90	220	150	75	90	190	210

On the grid below draw a box plot to show the results.

[4 marks]



4

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Section B – Commercial Manufacture

Answer **all** questions in this section.

0 5 When producing a die cut package, three different, independently occurring faults are possible with these probabilities:

Fault A: 1/100
Fault B: 1/100
Fault C: 1/500

A and **B** are minor faults which must be monitored but will only fail quality control if both faults are seen on a single product.

C is a critical fault and any product suffering from this fault will fail quality control.

If a batch of 10 000 packages are produced, calculate how many products would be expected to fail quality control.

[3 marks]

3

Turn over for the next question

Do not write outside the box

0 6 State **four** ways a manufacturer may use quality assurance procedures and policies to reduce the rate of errors during die cutting of packaging nets.

[4 marks]

1 _____

_____

2 _____

_____

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4

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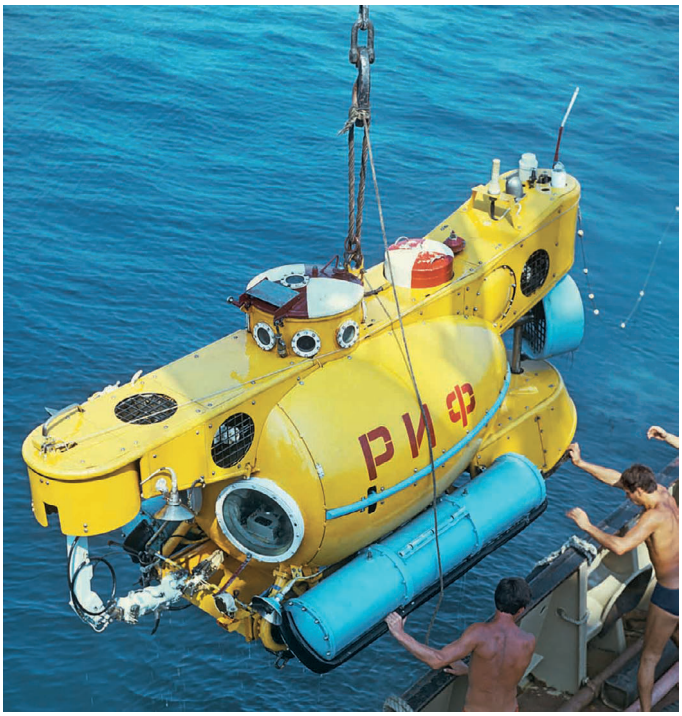
0 7 **Figure 3** shows a submarine.

Figure 3



Explain the specific virtual modelling techniques that may be used to test the design of a submarine before production.

[6 marks]

Do not write outside the box

6

0 8 Define the term Total Quality Management (TQM).

[2 marks]

2

0 9 For a specific application, give **two** reasons why a go no-go gauge would be used.

[3 marks]

3

1 0 State **three** characteristics associated with products from the Memphis postmodern design group.

[3 marks]

1

2

3

3

Do not write outside the box

1 1 Describe the methods used by manufacturers to conserve energy and materials during product development and manufacture.

[9 marks]

9

Do not write outside the box

1 2 **Figure 4** shows a low carbon steel component with a volume of 11 100 mm^3

The density of low carbon steel is 7.85 g/cm^3

The component is to be hot dip galvanised.

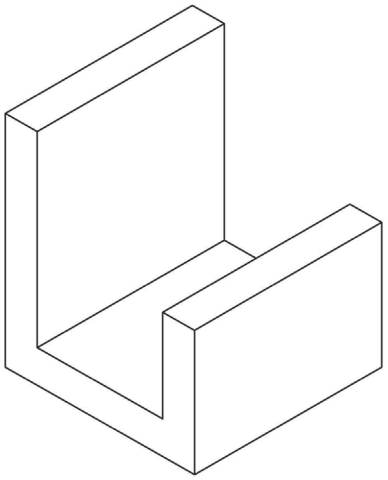
The galvanising process increases the mass of the component by 5%

Calculate the mass of the galvanised component in grams.

Show your working out.

[3 marks]

Figure 4
Isometric view



3

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1 3 Compare the two radios shown in **Figures 5** and **6**.

In your answer you should refer to developments in:

- microelectronics
- materials.

[12 marks]

Figure 5

Figure 6

	Figure 5 Fabricated plywood valve radio (1950s)	**Figure 6 Injection moulded digital radio (2015)**
Button/control material	Thermoset polymer	TPE
Electronics	Thermionic valves	Integrated circuits
Main casing material	Fabricated plywood	Injection moulded thermoplastic
Information display	No display	LCD screen

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12

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1 4 State **three** reasons why a designer may use a focus group.

[3 marks]

1 _____

_____

2 _____

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3 _____

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3

Turn over for the next question

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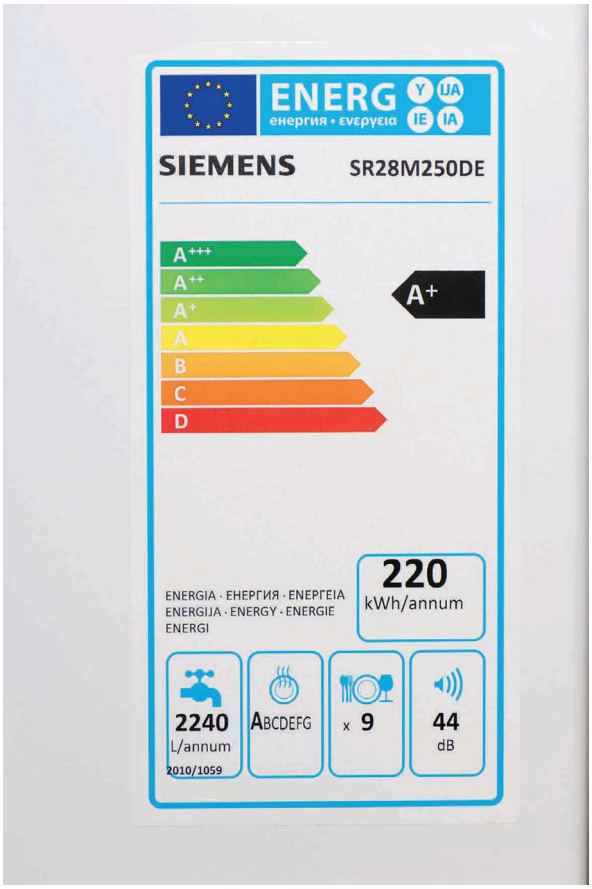
1 5 **Figure 7** shows a label often found on electronic products.

Explain the meaning of the label shown in **Figure 7**.

[2 marks]

Figure 7



2

END OF QUESTIONS