



Oxford Cambridge and RSA

**Friday 24 May 2019 – Afternoon**

**GCSE (9–1) Design and Technology**

**J310/01 Principles of Design and Technology**

**Time allowed: 2 hours**



**You must have:**

- the Insert (inserted)

**You may use:**

- a scientific calculator
- a ruler
- geometrical instruments



Please write clearly in black ink. **Do not write in the barcodes.**

Centre number

--	--	--	--	--

Candidate number

--	--	--	--

First name(s)

\_\_\_\_\_

Last name

\_\_\_\_\_

**INSTRUCTIONS**

- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- The Insert will be found inside this document, it must be used when answering questions in **Section B**.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).

**INFORMATION**

- The total mark for this paper is **100**.
- The marks for each question are shown in brackets [ ].
- Quality of extended response will be assessed in questions marked with an asterisk (\*).
- This document consists of **20** pages.

## SECTION A

Answer **all** the questions.

1 **Fig. 1** shows images of an adjustable table lamp.



**Fig. 1**

(a) The lamp base is made from a hardwood.

(i) Name a hardwood.

..... [1]

(ii) Give **two** characteristic properties of hardwood that make it suitable for the lamp base.

1 .....

.....

2 .....

.....

[2]

(b) The design of the lamp is influenced by the fashion style of Scandinavian design.

Give **two** other factors that influence the design of products.

1 .....

.....

2 .....

.....

[2]

(c) The lamp base can be adjusted allowing different heights and angles to be achieved.

Explain **one** reason why this feature benefits the user.

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

[2]

(d) The position of the lamp base is adjusted using the wing nut shown in **Fig. 1**.

The wing nut is made from stainless steel, a ferrous metal.

Give **one** characteristic property of ferrous metal that makes it suitable for this use.

.....

[1]

(e) The lamp is assembled using standard components such as the bulb fitting and switch.

Explain **one** benefit to the manufacturer of using standard components when manufacturing the lamps.

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

[2]

(f) Many modern lamps use LED (light-emitting diode) bulbs.

Give **one** reason why an LED bulb is suitable for use in a consumer product.

.....

[1]

(g) The lamp shade is made from laminated cardboard.

Give **one** reason why laminated cardboard is a suitable material for the lamp shade.

.....

[1]

(h) The lamp base is manufactured and sold in self-assembly form.

Explain why self-assembly products have become popular with consumers in recent years.

.....

.....

.....

.....

.....

.....

.....

[3]

(i)\* The choice of materials used in the lamp and its minimal design mean it is considered to be an example of a sustainable product.

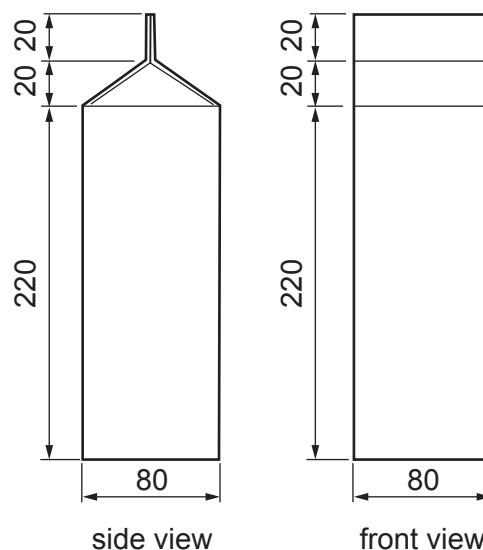
Discuss how designers can assess sustainability when designing and developing products.

To support your answer refer to examples that you are familiar with.

. [8]

2 A manufacturer makes three different designs of fruit juice cartons from card.

(a) **Fig. 2.1** shows the side and front view of one carton.  
Dimensions are given in millimetres (mm).



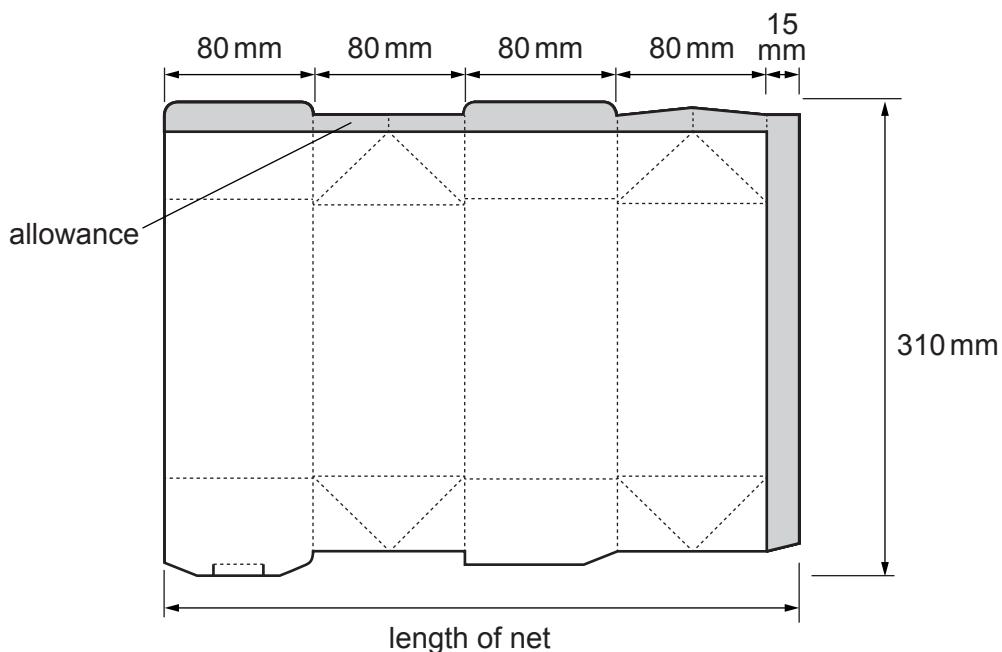
**Fig. 2.1**

(i) Complete the 3D isometric drawing of the carton in **Fig. 2.1** on the grid below. The grid points are 10 mm apart. Use the scale 1:2.



[4]

The carton is made from one piece of card using the development (net) shown in **Fig. 2.2**. An allowance of 15 mm for glue tabs is shown shaded in grey.



**Fig. 2.2**

(ii) Calculate the area of card needed to make one carton. Use the dimensions shown in **Fig. 2.2**. Give your answer in  $\text{mm}^2$ .

$$\text{Area} = \dots \text{mm}^2 \quad [2]$$

(iii) Calculate the number of cartons that can be cut from one A1 sheet of card with dimensions 594 mm  $\times$  841 mm.

$$\text{Number of cartons} = \dots \quad [1]$$

(iv) Give **one** benefit to the manufacturer of making this carton from a single material.

.....

..... **[1]**

(b) Fig. 2.3 shows another fruit juice carton that is made by the manufacturer.

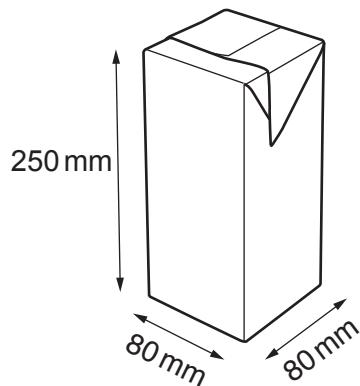


Fig. 2.3

(i) Calculate the volume of fruit juice the carton in Fig. 2.3 could contain. Give your answer in  $\text{cm}^3$ .

Volume = .....  $\text{cm}^3$  [2]

(ii) This design of carton is manufactured in two sizes to hold either 1.5 litres or 2 litres of fruit juice.

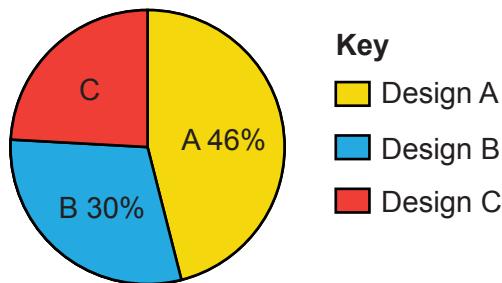
Given that 1 ml (millilitre) equals  $1\text{ cm}^3$ , state if the carton shown in Fig. 2.3 would hold 1.5 or 2 litres of fruit juice.

..... [1]

10

(c) The carton manufacturer asked 150 people to vote for their favourite fruit juice carton.

The results are shown on the pie chart below:



(i) Calculate the number of people who voted for Design A.

Number of people = ..... [1]

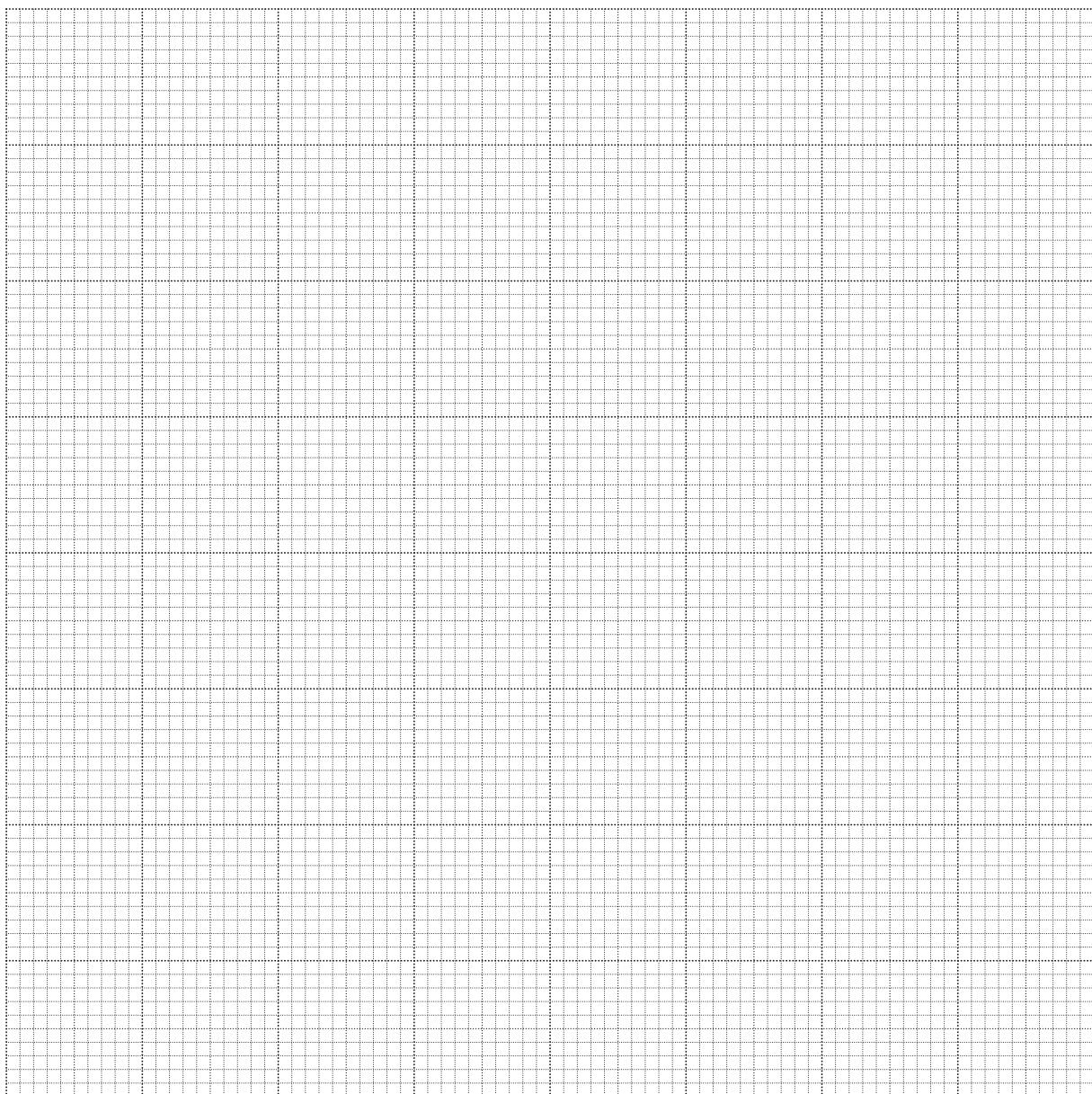
(ii) Thirty-six people voted for Design C.  
Calculate the percentage of people who voted for Design C.

Percentage = ..... [1]

(d) The table below shows the sales figures for 500 fruit juice cartons.

Carton design	Number of sales
A	76
B	180
C	244

Draw a bar chart on the grid below to show the data given in the table. Label your axes.



[3]

3 Fig. 3 shows a voice-controlled device that can play music, set alarms, control smart home devices, and provide information and news.



Fig. 3

(a) The device uses a number of inputs and outputs to function.

Complete the table below with the missing inputs or outputs and electronic components.

Function	Input or Output	Electronic component
Turn the device on.	.....	.....
Provides sound to play music.	.....	.....
Illuminates to show when the device is switched on.	.....	LED
Listens to the human voice.	.....	Microphone

[6]

(b) Most modern electronic devices use programmable microcontrollers.

Explain what a microcontroller does.

.....

.....

.....

.....

[2]

13

(c) New and emerging technologies are enhancing the function of many consumer products.

Give **one** example of a new and emerging technology and state how it is used to enhance the function of a product.

[2]

[2]

(d) Advances in 3D printing mean a range of materials can be 3D printed.

Discuss the impact that 3D printing is having on traditional manufacturing.

Use examples to support your discussion.

[6]

## SECTION B

Answer **all** the questions.

For **all** questions in Section B you **must** refer to the **Insert** which contains images and information about toys you could find in a children's nursery.

**4** Refer to **page 8** of the Insert.

**(a)** The Lego® bricks in **Images A** and **B** were originally designed in the 1930s and are still a popular children's toy today.

**(i)** The bricks are made from a thermo polymer.

Give **two** reasons why a thermo polymer is a suitable material for the bricks.

1 .....

.....

2 .....

.....

**[2]**

**(ii)** Give **one** reason why Lego® remains a popular toy.

.....

**[1]**

**(b)** The teddy bear in **Image C** is made from cotton which is a natural fibre.

**(i)** Give **two** reasons why natural fibre is a suitable material for the teddy bear.

1 .....

.....

2 .....

.....

**[2]**

**(ii)** The teddy bear is a Fairtrade® product.

Explain why consumers choose products with a Fairtrade® symbol.

.....

.....

.....

.....

.....

**[3]**

You need to answer questions **5** and **6** in relation to **one** of the products listed below covering an area you have studied in depth.

Information about the products is contained in the **Insert**.

Before you choose a product, read all parts of questions 5 and 6.

You **must** tick **one** box below to indicate your chosen product.

**Product 1:** Pop up book (papers and boards)

**Product 2:** Interactive play mat (fibres and fabrics)

**Product 3:** Musical microphone (design engineering)

**Product 4:** Ride on toy (polymers)

**Product 5:** Tricycle (metals)

**Product 6:** Toy train (timbers)

5 (a) Lifecycle assessment is a process of evaluating the impact of a product on the environment throughout its lifecycle.

Study and use the images and technical information about your chosen product given on the Insert.

Explain the lifecycle of your chosen product and its impact on the environment.

Your explanation **must** include:

- the main material used and its source
- energy used in the different stages of the lifecycle
- the disposal and recycling of the product.

[9]

(b) Having considered your product's lifecycle, describe **two** ways that your product's effect on the environment could be minimised.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

[4]

**Question 5 (c) begins on page 18**

(c) Refer to the Insert which identifies the **main part** of your chosen product.

For the **main part** of the product:

- Describe the manufacturing process or processes that could be used to make it in quantities of 5000 or more. Use sketches and notes to support your answer.

[9]

6 You should use **the same** product you chose for Question 5 to answer this question.

(a) Identify **one** working or physical property of a material/component used in your chosen product and state why this makes it suitable for use in the product.

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

[2]

(b) When designing the toys, the needs and views of the primary users and wider stakeholders would have been considered.

When the primary user is a young child, identify **two** stakeholders that should also have been considered when designing the toys.

1 .....  
2 .....  
.....

[2]

(c) The structural integrity of products designed for children is important to ensure safety and reliability.

Explain how your chosen product is designed to withstand the forces and stresses of use by children.

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

[3]

20

**(d)\*** Discuss why ergonomics are important in the design of children's products.

Use examples to support your answer.

[8]

**END OF QUESTION PAPER**

---

OCR

Oxford Cambridge and RSA

### Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.