

Surname	Centre Number	Candidate Number
Other Names		0



GCSE – NEW

C600U10-1



FRIDAY, 24 MAY 2019 – AFTERNOON

DESIGN AND TECHNOLOGY
Component 1
DESIGN AND TECHNOLOGY IN THE 21st CENTURY

2 hours

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
Section A	1.	10
	2.	10
	3.	15
	4.	20
	5.	20
Section B	6.	25
	Total	100

ADDITIONAL MATERIALS

You will need basic drawing equipment, coloured pencils and a calculator for this examination.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer questions 1 to 5 and **ONLY ONE** question 6.

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

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question. If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

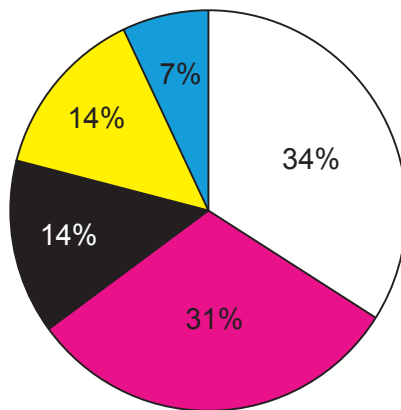
You are reminded of the necessity for good English and orderly presentation in your answers.

SECTION A*Answer all questions.*

This question is about the life cycle of products.

1. (a) The average UK household spends approximately £1800 per year on clothes.

The pie chart below shows the destination percentages of these clothes once they are no longer required by their original owner.

DESTINATION OF USED CLOTHING IN THE UK

Overseas reuse
 Landfill
 UK Reuse
 Recycling
 Incineration

- (i) State the percentage of clothes that were sent to landfill. [1]

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- (ii) Calculate the percentage of clothes that were incinerated and sent to landfill. [1]

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- (iii) If all the clothes that were incinerated and sent to landfill were recycled, how much of the £1 800 would be spent on recycling? (Show all workings.) [2]

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(iv) Explain the meaning of the term 'carbon footprint'. [2]

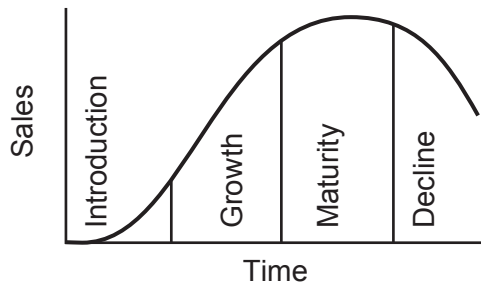
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(b) (i) The diagram below shows a typical product life cycle. Explain what happens during the decline stage. [2]

The Product Life Cycle Stages



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(ii) Many products end up in landfill sites. Explain the impact this has on the environment. [2]

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This question is about materials technology.

2. (a) The sportswear images below have been made from a material called Rhovyl.



Describe the properties of this material when used for sportswear.

[3]

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(b) A blend of Nomex and Kevlar is used to manufacture the fabric of a fire-person's uniform, as seen in the picture below.



Explain the advantages of blending these fibres together.

[2]

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(c) The cutlery handle below has been formed using Polymorph pellets.



Describe how the Polymorph pellets are used to make the cutlery handle.

[2]

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(d) Polymorph is classed as a smart material. Analyse how the use of a different smart material in a product could be a safety or warning feature to the user.

[3]

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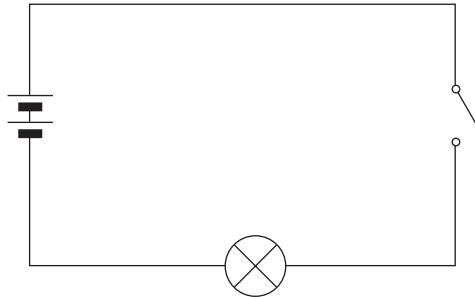
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This question is about electronic systems, programmable components and mechanical devices.

3. (a) The following is a diagram of a simple circuit.



- (i) On the circuit diagram above, label the power source and the switch. [2]
- (ii) The image below shows a modern street light. Explain how LDRs (Light Dependant Resistors) work in modern street lighting. [2]



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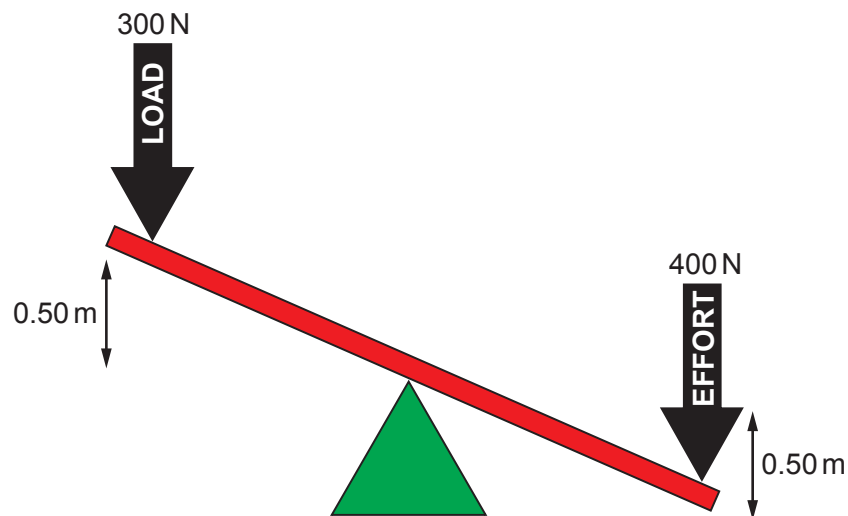
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(b) This question is about mechanical advantage and velocity ratio calculations.

Study the picture below before answering the questions that follow.



- (i) Calculate both the mechanical advantage and velocity ratio of the see-saw. 2 × [2]
(Show all workings.)

Mechanical Advantage:

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Velocity Ratio:

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- (ii) Explain the role of the fulcrum in the see-saw. [1]

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- (iii) State what would happen if you changed the position of the fulcrum. [1]

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- (c) (i) Describe the difference between a microprocessor and a microcontroller. [3]

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- (ii) Explain **one** disadvantage of using a programmable microcontroller. [2]

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This question is about materials.

4. (a) The image below shows corrugated cardboard which is used for packaging.



(i) The weight of paper and cardboard is measured in gsm. State the full meaning of gsm. [1]

G S M

(ii) State how the structure of corrugated cardboard makes it suitable for packaging. [1]

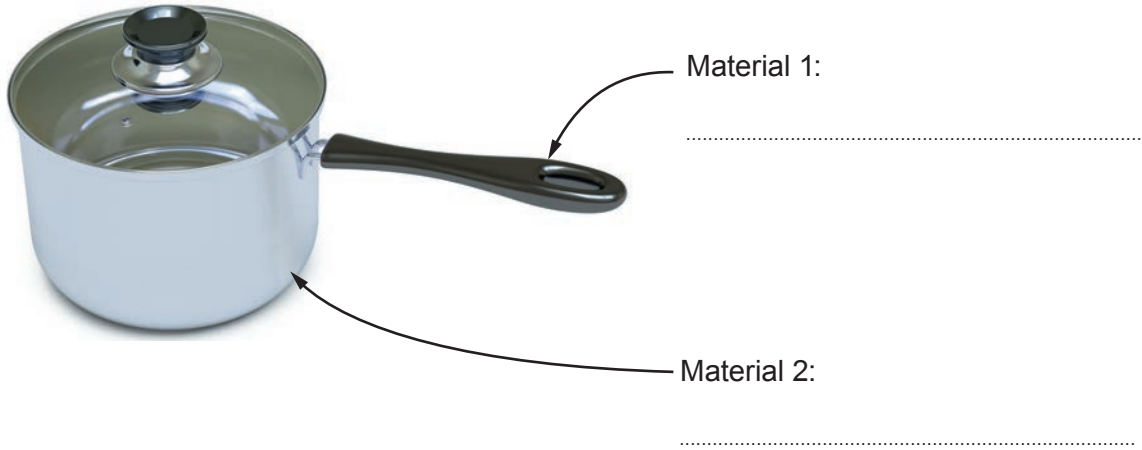
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(iii) Describe **one** disadvantage of corrugated cardboard when used to make models. [2]

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(b) The image below is of a modern-day saucepan.

(i) Label the **two** most suitable materials used to manufacture the saucepan pictured below. 2 × [1]



(ii) Discuss the working properties of **one** of the materials identified in (i) above that make it suitable for the saucepan. [2]

Chosen material:

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(c) The picture below is a radiator cover made from MDF.



(i) State the full meaning of MDF. [1]

M D F

(ii) Name a piece of CAM (Computer Aided Manufacture) equipment that could have been used to create the pattern on the radiator cover. [1]

(iii) Discuss the reasons why MDF is such a versatile material in the construction of products such as the radiator cover. [4]

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(iv) Explain using an example, how the aesthetic qualities of MDF can be improved. [2]

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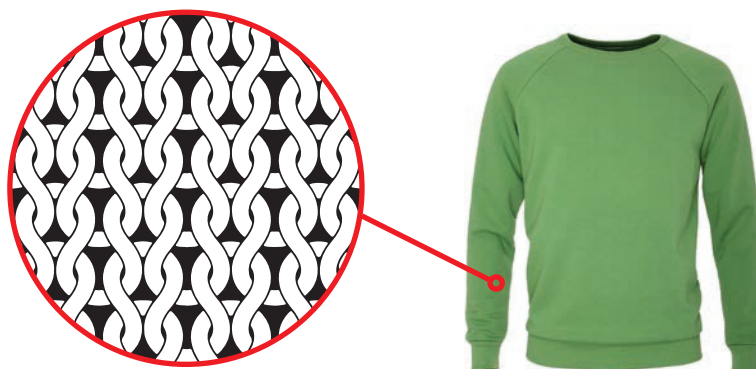
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- (d) Below is a picture of a jumper manufactured from a natural animal polymer.



- (i) Name the natural animal polymer used to manufacture this jumper. [1]

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- (ii) Describe why a natural animal polymer has been used for the knitted jumper. [3]

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5. Carefully study the images below and select **one** product to refer to when answering the questions (a) to (c). Place a **tick (✓)** in the box of your selected product.

		
<i>Drinks carton</i> <input type="checkbox"/>	<i>Fabric bag for life</i> <input type="checkbox"/>	<i>Watch with metal strap</i> <input type="checkbox"/>
		
<i>Under bed boxes</i> <input type="checkbox"/>	<i>LED head torch</i> <input type="checkbox"/>	<i>Veneer packaging/boxes</i> <input type="checkbox"/>

(a) Most products are designed with more than one function in mind.

(i) State the main function of your chosen product.

[1]

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(ii) Analyse why your chosen product's material is sustainable. [2]

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(b) Collecting primary and secondary source research is required to ensure client and user needs are identified and met when designing.

(i) Describe using examples, the differences between primary and secondary source research. [3]

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(ii) Evaluate how successful your chosen product is in terms of its ergonomic design. [4]

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- (c) (i) Explain why a user-centred design approach is so important for the successful design of your chosen product. [2]

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- (ii) All of these products have been manufactured commercially, but in various quantities. Identify which scale of production is being described below:

I. A continuous run of identical products. [1]

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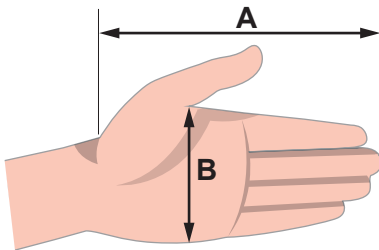
II. A small product run of identical products. [1]

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III. A unique product made for one person. [1]

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- (d) The picture and table below show collected anthropometric data from five students' hand measurements.



Student	Length (A)	Width (B)
1	100 mm	53 mm
2	103 mm	45 mm
3	90 mm	48 mm
4	95 mm	44 mm
5	102 mm	50 mm

- (i) State which student has the shortest hand length. [1]

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- (ii) Calculate the average hand width of all five students. (Show all workings.) [2]

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- (iii) The average diameter of the index finger of the five students was found to be 16 mm.

Calculate the circumference of the index finger so that a suitable length of silver wire can be used to make a circular ring.

(Show all workings.)

[2]

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SECTION B

6. Electronic systems programmable components and mechanical devices

(a) The picture below is of a Robotic Vacuum Cleaner.



(i) The robotic vacuum cleaner is commercially manufactured in batches. Name a suitable method of construction used to make the main body casing. [1]

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(ii) Outline **two** advantages of using the method of manufacture identified in (i) above. [2]

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(iii) Name a suitable thermoplastic to make the main body casing and give **one** reason why it is suitable. [2]

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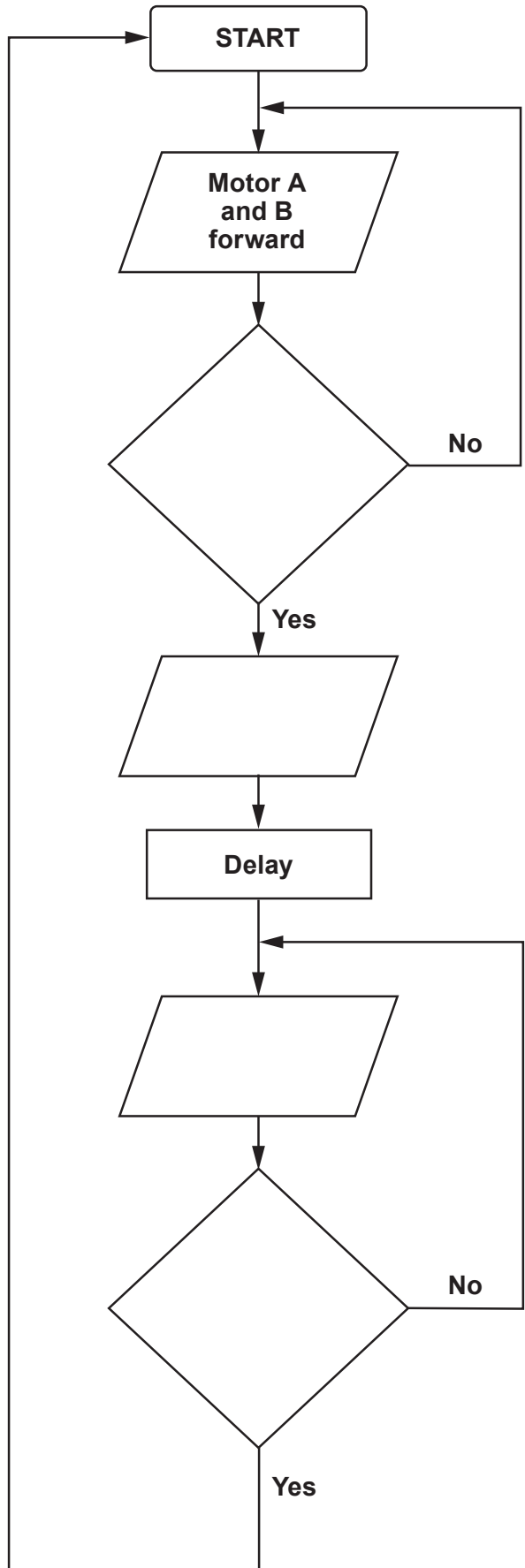
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(iv) At the end of every use, the robotic vacuum cleaner parks itself in a charging dock. Complete the flow chart below using the stages listed to show control of the vacuum cleaners movements. [4]

Examiner only



STAGES

Motor A off
motor B
forward

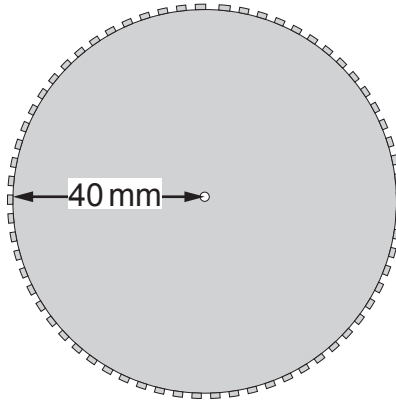
Dust
container
sensor
activated

Proximity
sensor
activated

Motor A and
motor B
forward

C600U101
19

- (b) The battery life of the robotic vacuum cleaner is equal to 175 revolutions of its wheel, shown below. After 150 revolutions, the robotic cleaner returns to the docking station for a recharge.
(Show all workings.)



- (i) Calculate the diameter of the wheel. [1]

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- (ii) Calculate the circumference of the wheel. [2]

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- (iii) Calculate how far the robotic cleaner will have travelled before it returns to the docking station. [1]

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- (iv) Round off your answer in (iii) above to the nearest metre. [1]

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- (c) A new robotic vacuum cleaner comes with main component parts, accessories and packaging.

Undertake a Life Cycle Analysis of this electronic product explaining the impact it has on the environment. [5]

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- (d) The robotic vacuum cleaner was manufactured in a factory that uses a batch production system.

Evaluate the benefits of this method of production. [6]

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