GCSE (9-1)

eduqas
Part of WJEC

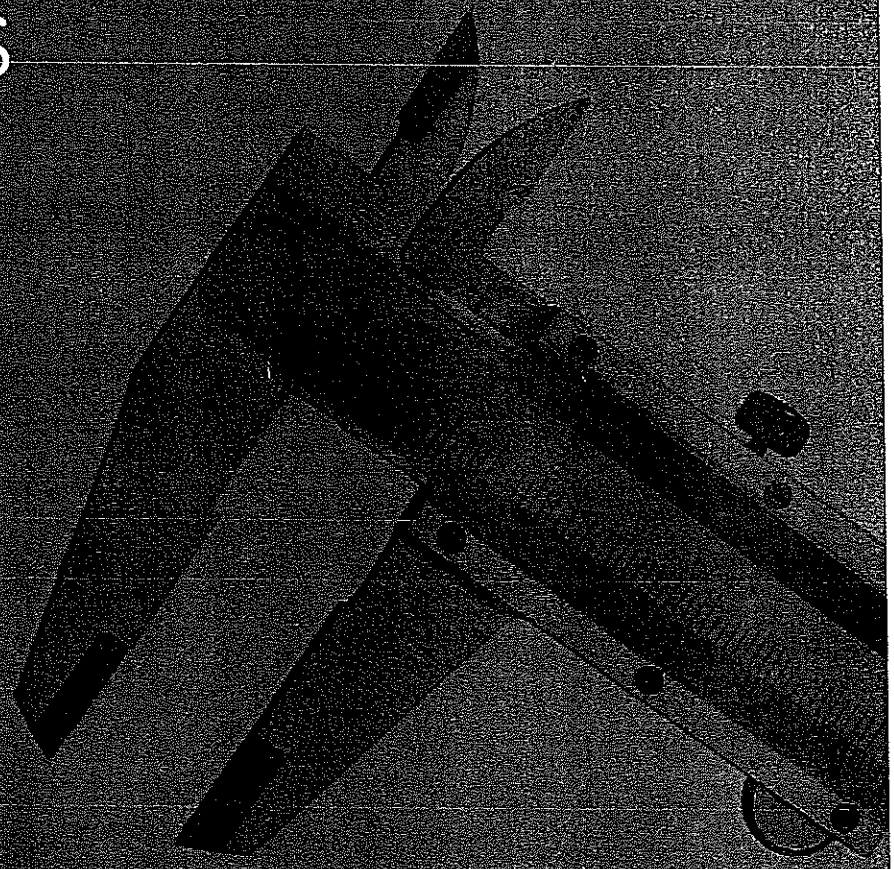
WJEC Eduqas GCSE (9-1) in

DESIGN AND TECHNOLOGY

ACCREDITED BY OFQUAL

SAMPLE ASSESSMENT MATERIALS

Teaching from 2017



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wjec cbac

eduqas

For teaching from 2017
For award from 2019

GCSE (9-1) DESIGN AND TECHNOLOGY

SAMPLE ASSESSMENT MATERIALS

Contents

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE

DESIGN AND TECHNOLOGY

COMPONENT 1

DESIGN AND TECHNOLOGY IN THE 21st CENTURY

SAMPLE ASSESSMENT MATERIALS

2 Hours

For examiner's use only			
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

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

Answer questions 1 to 5 and any **one** question 6.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

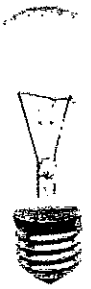
The number of marks is given in brackets at the end of each question or part-question.

Section A

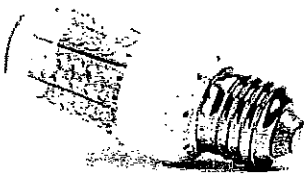
Answer **all** questions

This question is about energy.

1. (a) Traditional light bulbs have been phased out and replaced by newer LED bulbs.



Traditional light bulb



LED bulb

(i) The table below shows the costs related to running each light bulb for an average day.

Bulb Type	*Power*	*Cost per day (Pence)*
Traditional light bulb	100W	6.97p
LED bulb	18W	1.26p

Calculate the cost of running each bulb for one year and the percentage saving that will be made by using the LED bulb. (*Show all workings.*) [4]

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(ii) Without referring to the savings shown above, explain why LED bulbs have replaced traditional light bulbs. [2]

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(b) (i) Explain **one** disadvantage of relying on wind power to produce energy. [2]

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(ii) Describe how installing solar panels onto a factory roof can bring benefits for a car manufacturer. [2]

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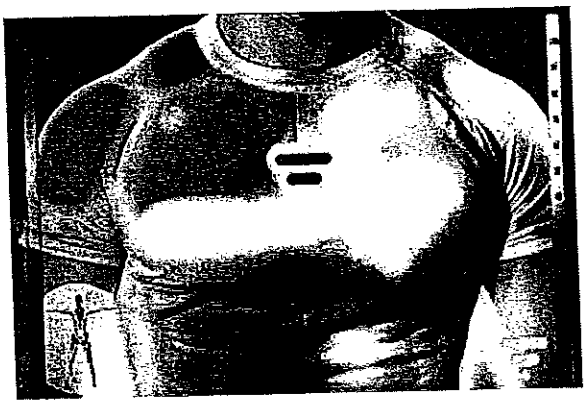
This question is about materials technology.

2. (a) The sports training shirt below has been made using a thermochromic smart material.



Explain why a thermochromic smart material has been used. [3]

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(b) Explain why a composite material is suitable for the frame of the squash racquet shown. [2]

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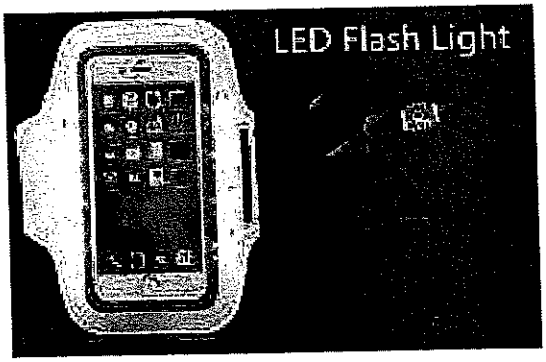
(c) Study the wearable electronic device shown below. It is a holder with a mobile phone in it that can be strapped to a person's arm.



Describe **one** innovative feature that makes this product appeal to potential customers. [2]

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(d) Analyse the impact that recent developments in materials technology has had on a specific named household product. [3]

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

3. (a) The systems approach of input, process and output is commonly used to analyse electronic and mechanical products.

(i) Place a **tick (✓)** in the box to indicate the correct term for **each** of the statements. [2]

Statement	*Input*	*Process*	*Output*
The sound produced by a radio speaker.			
Pressing the button on a computer mouse.			

(ii) Explain why feedback is an important feature when controlling a central heating system for a house. [2]

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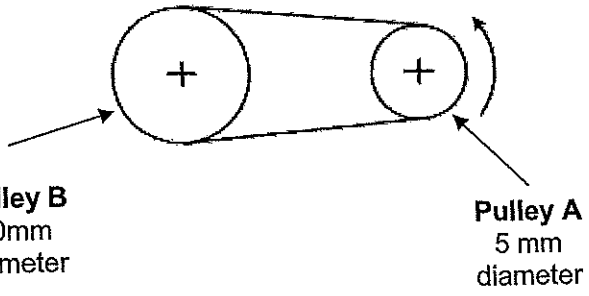
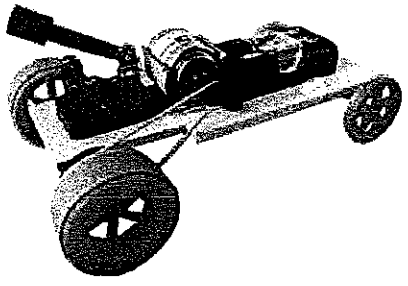
(b) The pulley system shown below is used to drive the toy vehicle.



Pulley B
40mm
diameter

Pulley A
5 mm
diameter



(i) Calculate the rotational velocity (RV) of Pulley B when the motor connected to Pulley A rotates at 300rpm. [4]

(Show all workings.)

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(ii) Give **one** reason why this type of pulley system is suitable for the toy vehicle.

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..... [1]

(iii) State how the design of the pulley system could be changed to make the wheels go faster.

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..... [1]

(c) (i) Describe three stages of programming a microcontroller.

Stage 1: .....

..... [1]

Stage 2: .....

..... [1]

Stage 3: .....

..... [1]

(ii) Explain **one** of the main benefits of using a programmable microcontroller. [2]

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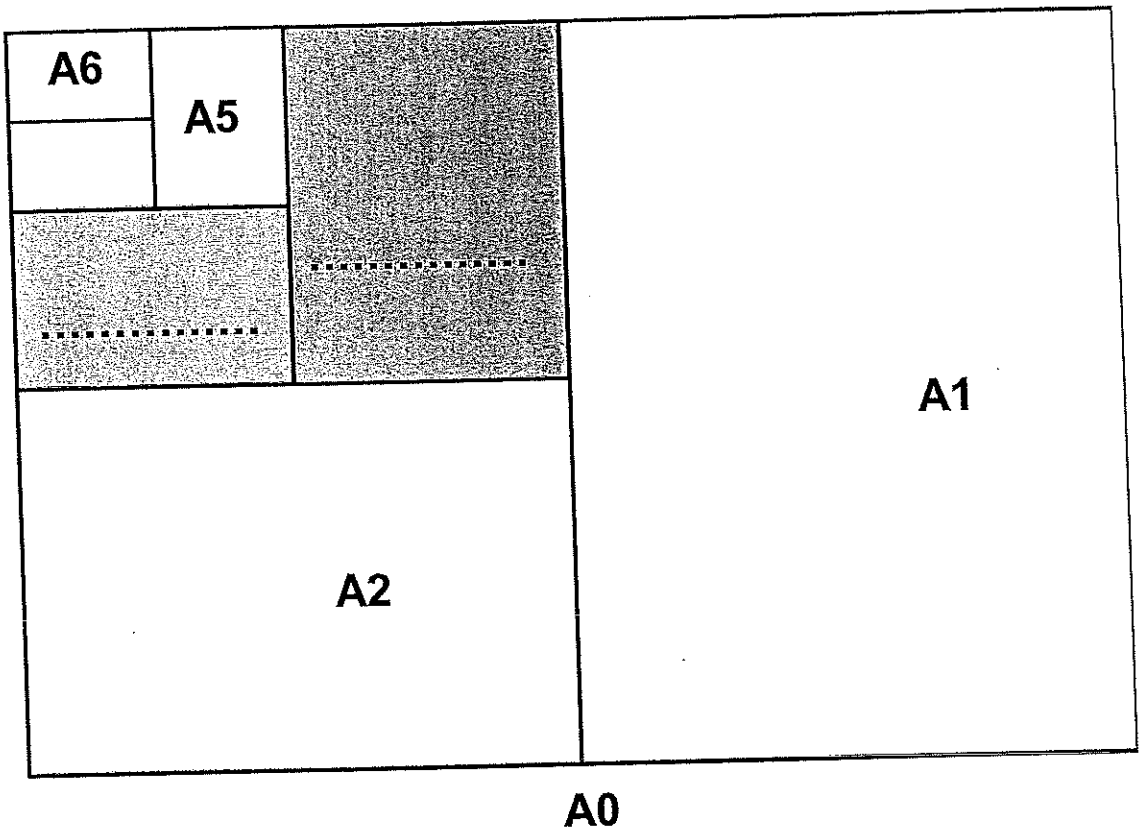
This question is about materials.

4. (a) (i) Study the image below and label the missing ISO paper sizes in the spaces provided. (*Some have been done for you.*) 2 x [1]



(ii) The menu shown below is made from paper.

Describe a process that could be carried out on the paper menu to protect the surface so that the menu can be reused several times over. [2]

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(b) Soft drinks are sold in a range of containers including metal cans and plastic bottles.

(i) Describe **two** characteristics of aluminium that makes it suitable to be used for the drinks can below. [2]

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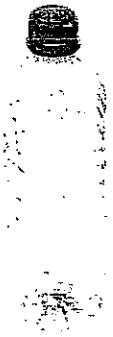
(ii) Describe one benefit of making a drinks bottle such as the one shown below out of a thermoplastic material. [2]



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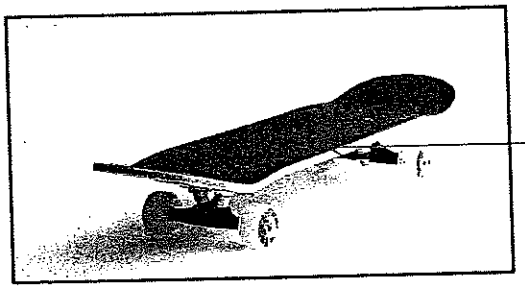
(c) Study the skateboard pictured below.



(i) Discuss the properties of plywood that make it suitable for use as a skateboard deck. [3]

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(ii) Name the process used to create the shape of the skateboard deck in plywood. [1]

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(iii) The skateboard wheels are made from nylon. Give **two** properties of nylon that make it suitable for the wheels

Property 1: .....

..... [1]

Property 2: .....

..... [1]

(iv) The skateboard deck has been designed with a textured finish. Explain the importance of having a textured finish applied to the whole surface of the deck. [2]

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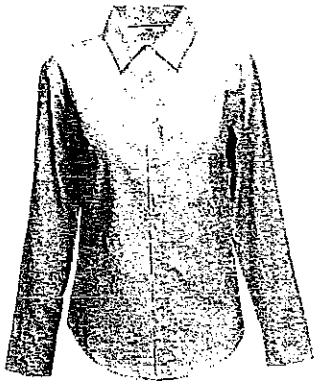
(d) The shirt pictured below is made from polyester cotton.



(i) Give **one** reason why fibres are mixed in the production of textile materials. [1]

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(ii) Evaluate the properties of polyester cotton that make it a suitable material for the shirt shown above. [3]

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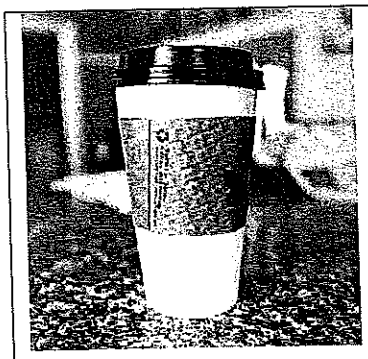
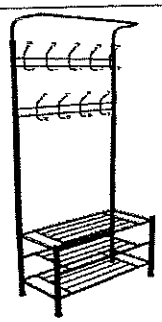
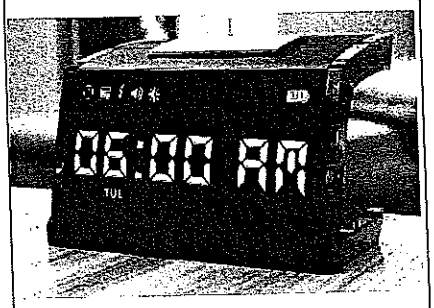
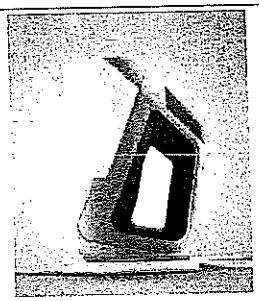
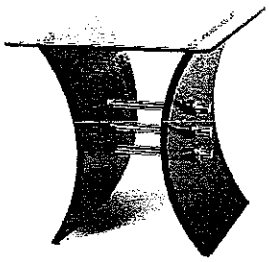
5. Carefully study the images below and select **one** product to refer to when answering the questions (a) to (c). *Place a* **tick (✓)** *in the box of your selected product.*

 100,000s are manufactured	 50 are manufactured	 1,000 are manufactured
Recycled coffee cup and sleeve ☐	*Metal coat and hat stand* ☐	*Digital alarm clock* ☐
 30,000 are manufactured.	 100 are manufactured	 1,000 are manufactured
Modern kettle ☐	*Sculptural table* ☐	*Rucksack style bag* ☐

(a) Products are made in different scales of production.

(i) State the most suitable scale of production for your chosen product. [1]

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(ii) Evaluate the suitability of this scale of production for your chosen product. [3]

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(b) (i) Analyse your chosen product in terms of its environmental impact. [2]

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(ii) Evaluate your chosen product in terms of two safety considerations.[4]

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(c) (i) You have been asked to redesign your chosen product.
Describe **one** benefit of using the design strategy of collaboration to carry out this task. [2]

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(ii) For your chosen product, identify a type of drawing that could be used to:

I show your initial ideas for discussion; [1]

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II show your final proposal to a potential client; [1]

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III provide details for manufacture. [1]

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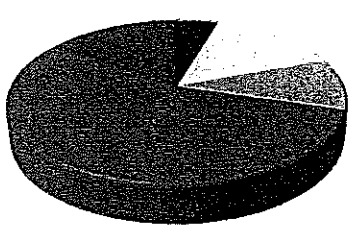
(d) The pie chart below shows a breakdown of the costs that will determine the final selling price of earphones for a mobile device.



(i) State the percentage that energy represents.

..... [1]

(ii) If the earphones are priced at £17.50, calculate how much profit is made if 80 sets are sold. [2]

(Show all workings.)

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(iii) The cost of materials and manufacturing has increased which has reduced the profit margin to 13.65%. Calculate the selling price that would be needed to make the same profit on each set of headphones sold. [2]

(Show all workings.)

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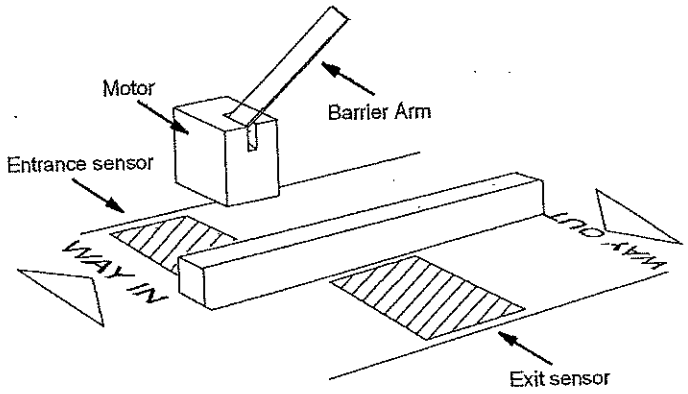
Section B

Answer **one** of the questions in this section

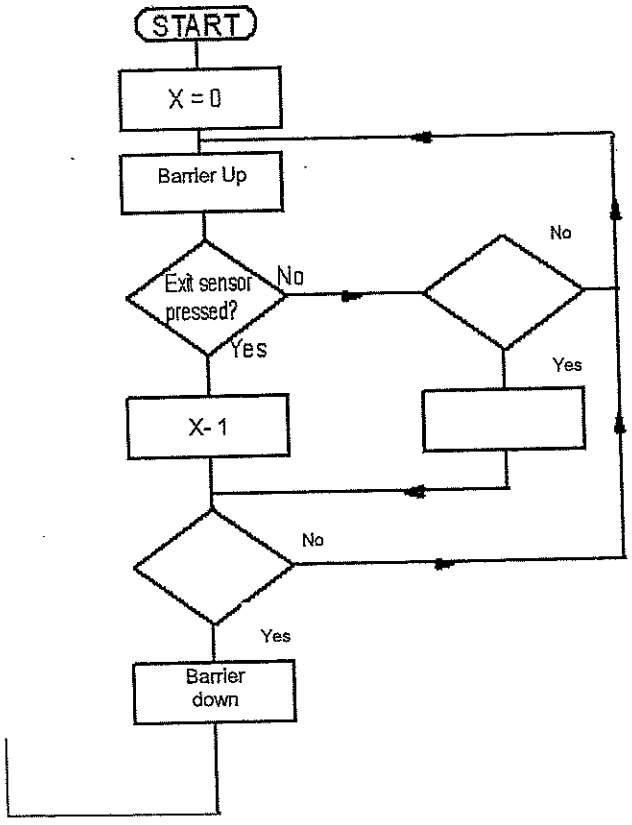
6. Electronic systems and mechanical devices

(a) The car park barrier system below controls entry to a car park with 10 parking spaces.



The car park has 10 spaces. The barrier arm stays up and allows cars to enter unless the car park is full. The barrier arm then drops down and stays down until a car leaves.

(i) Complete the flowchart below to show control of the car park barrier, using the statements provided and any additional arrows required *(Note: X represents the number of cars)* [4]

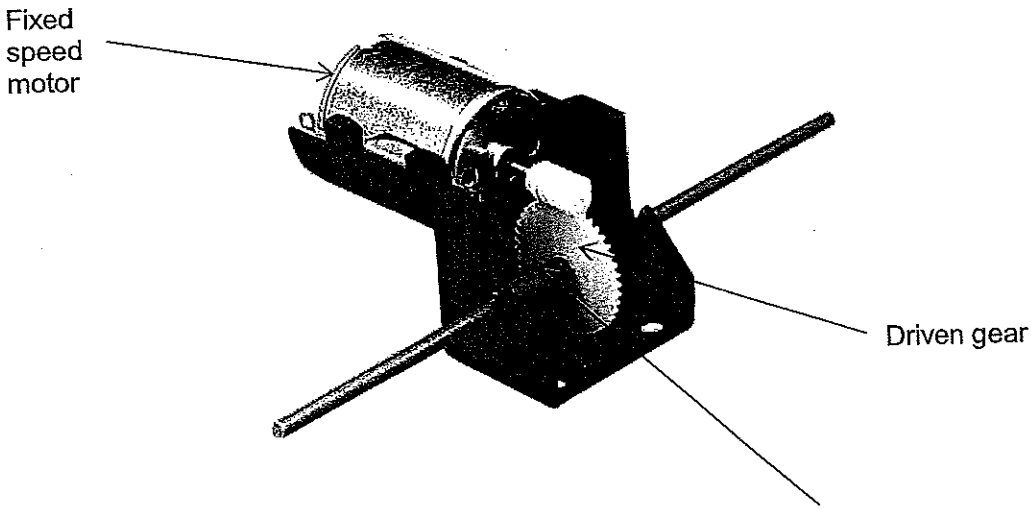


Is X = 10?

X+1

Entrance sensor. Pressed?

(ii) The designer has built a model of a car park barrier using the mechanism shown below.



I State the correct name of the mechanism shown. [1]

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II Give **one** reason why this type of mechanism is suitable for the model. [1]

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III State **one** purpose of the component labelled A in the picture of the mechanism above. [1]

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(iii) The mechanism has a fixed speed motor; explain why this type of motor has been used. [2]

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(b) The original design of the mechanism used a pulley system as shown below. Calculate the length of the belt required for the pulley system. *(Show all workings.)* [5]

Radius of each pulley 200mm

Distance between centres 40cm

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(c) Different parts of the car park barrier system are sourced from third world countries. Analyse how this is a benefit for third world countries. [5]

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(d) It is important that designers consider the world we live in and the needs of future generations.

Evaluate how designers can lessen the impact on our environment when designing new electro-mechanical products such as the car park barrier system. [6]

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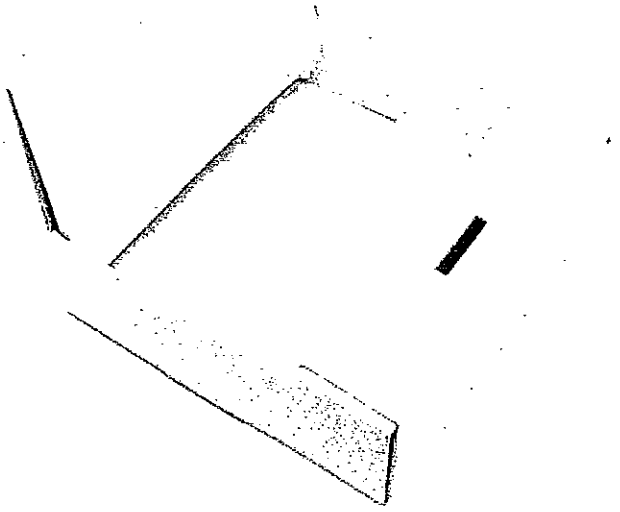
6. Papers and Boards

(a) The photograph below shows a plain white collection box for a charity.



(i) The collection box is made from 500 micron folding boxboard. It is 300mm wide and 450mm long.

I Explain the meaning of the word 'micron' in the sentence above. [1]

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II Give a reason why white folding boxboard has been used for the collection box. [1]

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(ii) Give **one** reason why the collection box has been designed to have glue free temporary folded joints. [1]

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(iii) The collection box is to be laser cut. Explain why the net/development would be drawn using CAD and two different coloured lines. [2]

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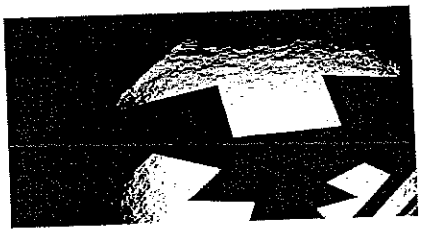
(iv) A new customer has seen the collection box and requires a high gloss UV varnish finish similar to the image below.



Explain how the gloss finish is applied by UV varnishing. [4]

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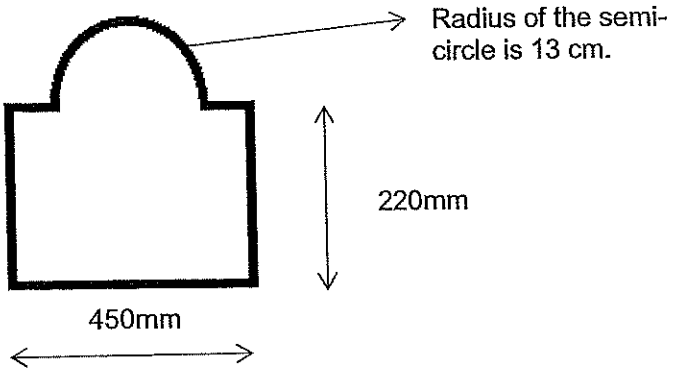
(b) Details of a modified design for the lid of the collection box are shown below.



Calculate the area of the lid of the collection box. *(Show all workings.)* [5]

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(c) Analyse why companies based in the UK might choose to source card or paper from third world countries when making bulk purchasing decisions. [5]

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(d) It is important that designers consider the world we live in and the needs of future generations.

Evaluate how designers can lessen the impact on our environment when designing new products which include papers and boards. [6]

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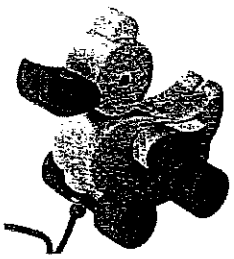
6. Natural and manufactured timber

(a) Study the pull-along toy shown below.



Pull-along toy
Wheels : Beech
Body : MDF
Pre-assembled

(i) State **one** property of beech that makes it suitable for the pull-along toy wheels. [1]

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(ii) Give **a** reason why:

I each part of the pull-along toy has had a finish applied; [1]

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II varnish lacquer is a suitable choice of finish for the body of the pull-along toy. [1]

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(iii) Describe how you would prepare the surface of the MDF body before applying the varnish lacquer finish. [2]

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(iv) Describe a method of making four identical wheels for the pull-along toy in a school workshop. [4]

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(b) The wheels of the pull-along toy are 25 mm diameter. The wheels of one toy are to be painted blue instead of red. If the wheels are 20 mm wide, calculate the total surface area of **one** wheel in order to estimate the quantity of paint required. *(Show all workings.)* [5]

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(c) The pull-along toys are to be sold under the fair trade logo. Analyse the impact on communities and workers who benefit under this scheme. [5]

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(d) It is important that designers consider the world we live in and the needs of future generations.

Evaluate how designers can lessen the impact on our environment when designing new products which include natural and/or manufactured timber. [6]

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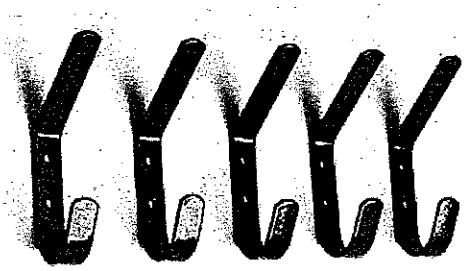
6. Ferrous and non-ferrous metals

(a) The plastic coated mild steel hooks shown below come in a range of colours.



(i) State a property of mild steel that makes it suitable for this application. [1]

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(ii) Give a reason why:

I the mild steel hooks need to have a finish applied; [1]

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II plastic coating is a suitable choice of finish for the mild steel hooks. [1]

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(iii) Describe how the plastic coating could be applied to a mild steel hook. [2]

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(iv) Describe a method of ensuring that the holes on each of the mild steel hooks are positioned identically when making 5 hooks in a school workshop. [4]

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(b) You have been asked to make 15 hooks out of either aluminium or mild steel.

Each hook is 210mm long and you need to allow 3mm for cutting / waste.

Use the information in the table below to calculate the difference in materials costs of producing 15 hooks in aluminium or mild steel, using the readily available lengths of bar shown in the table. *(Show all workings.)* [5]

Material	Length of bar	Cost of bar
Aluminium	1m	£5.10
Mild Steel	2m	£3.80

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(c) Analyse why consumers might choose metal products made in third world countries when making purchasing decisions. [5]

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(d) It is important that designers consider the world we live in and the needs of future generations.

Evaluate how designers can lessen the impact on our environment when designing metal products such as the coat hook. [6]

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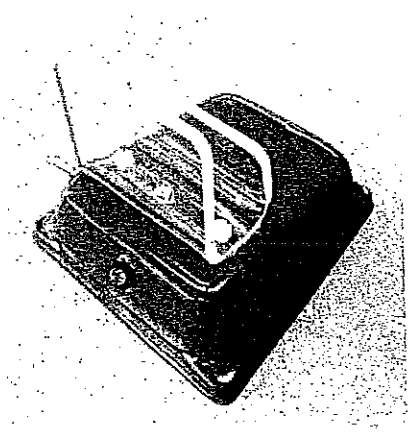
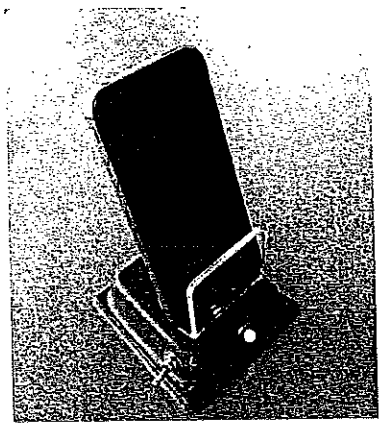
6. Thermosetting and thermoforming plastics

(a) A student has designed and made a mobile phone stand as shown below.





(i) Name a suitable thermoplastic material that could be used to make the hollow base of the stand. [1]

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(ii) Name the process used to make the hollow base of the stand. [1]

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(iii) Explain why the mould used to make the hollow base has smooth tapered sides. [2]

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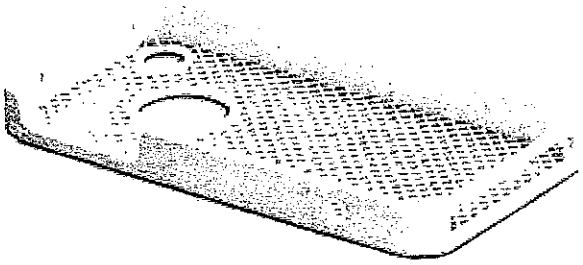
(b) A protective case for a mobile phone shown below has been injection moulded.



(i) Give **one** reason why injection moulding is the most suitable choice for manufacture of the protective case. [1]

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(ii) Describe how the process of injection moulding would be carried out to make the protective case [4]

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(iii) Before producing the injection moulded case, several prototypes are to be made using 3D printing. The designer has calculated that two 3D printed protective cases require a 65cm length of ABS filament wire for manufacture.

Calculate the number of prototype protective cases that can be made from one 25m reel of ABS filament wire and the cost of material (to the nearest whole pence) for each protective case, if the reel of ABS costs £5.90. *(Show all workings.)* [5]

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(c) Analyse why consumers might choose mobile phone protective cases made in third world countries when making purchasing decisions. [5]

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(d) It is important that designers consider the world we live in and the needs of future generations.

Evaluate how designers can lessen the impact on our environment when designing new plastic products such as the protective mobile phone case. [6]

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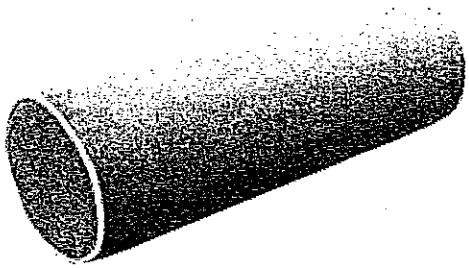
6. Fibres and textiles

(a) Study the pictures of the two cushions shown below and answer the questions that follow.

Floor cushion



Bolster cushion

(i) State the name of the edge finish that has been used on both cushions and give a reason for its use.

Edge finish: ..... [1]

Reason: .....

..... [1]

(ii) The main material used for both cushions is woven cotton. Give **one** reason why a material with a woven construction is the most suitable choice for these products. [1]

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(iii) Explain why it is important to lay templates out following pattern language in the construction of the two cushions. [2]

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(iv) The pink flower design shown below needs to be appliquéd onto the bolster cushion to co-ordinate the two cushions.

Describe how you would applique the flower design onto the bolster cushion. [4]

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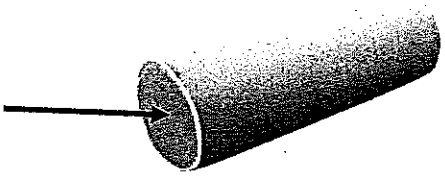
(b) The finished diameter of the circular ends on the bolster cushion is 20cm as shown below.

Circular end panel with a finished diameter of 20cm



Calculate what the circumference of the circular template would need to be in order to achieve the finished measurement (a seam allowance of 1.5cm will need to be included in your calculation), and how many cylindrical sides of the bolster cushion can be cut from a 5 m length of fabric. *(Show all workings.)* [5]

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(c) The cushions are to be sold under the fair trade logo. Analyse the impact on communities and workers who benefit under this scheme. [5]

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(d) It is important that designers consider the world we live in and the needs of future generations.

Evaluate how designers can lessen the impact on our environment when designing new textile products. [6]

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