GCSE (9-1)

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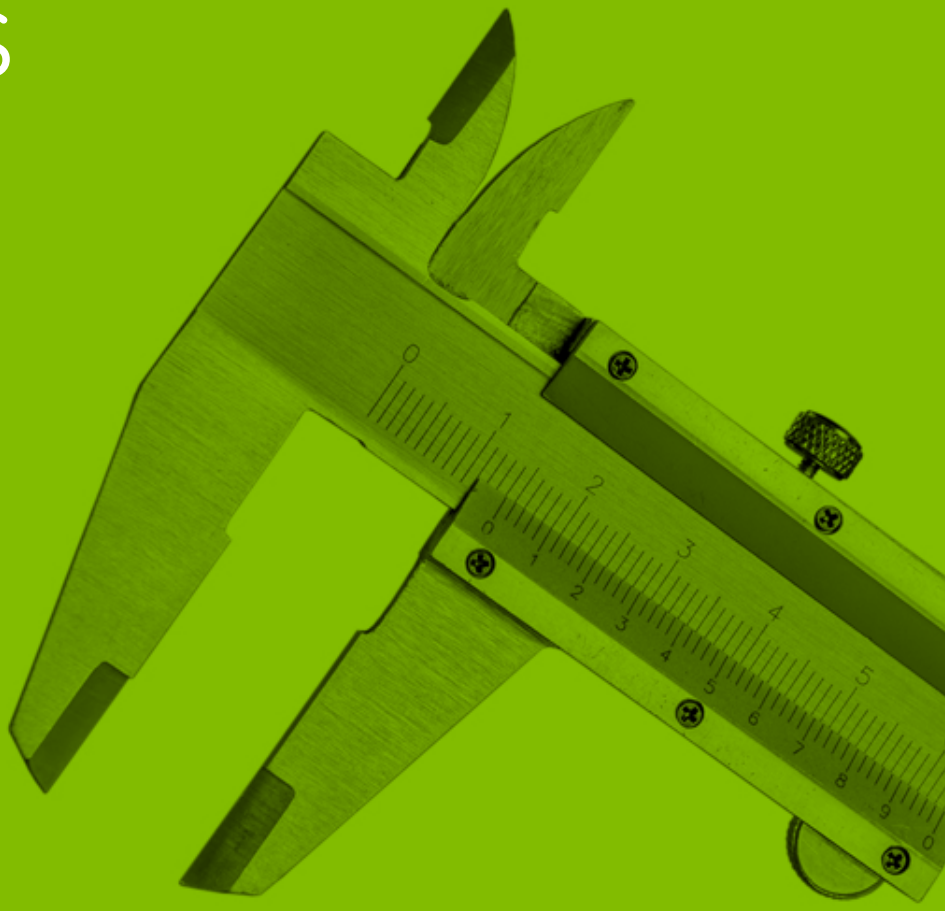
WJEC Eduqas GCSE (9-1) in

DESIGN AND TECHNOLOGY

ACCREDITED BY OFQUAL

SAMPLE ASSESSMENT MATERIALS

Teaching from 2017



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This Ofqual regulated qualification is not available for candidates in maintained schools and colleges in Wales.

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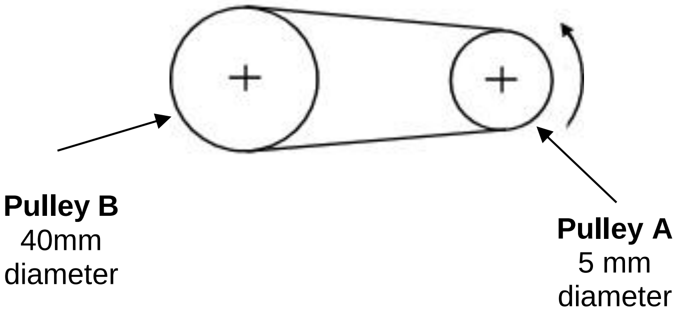
(b) The pulley system shown below is used to drive the toy vehicle.



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

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

Stage 1: ..……..……..……

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Stage 2: ..……..……...

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Stage 3: ..……..……...

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

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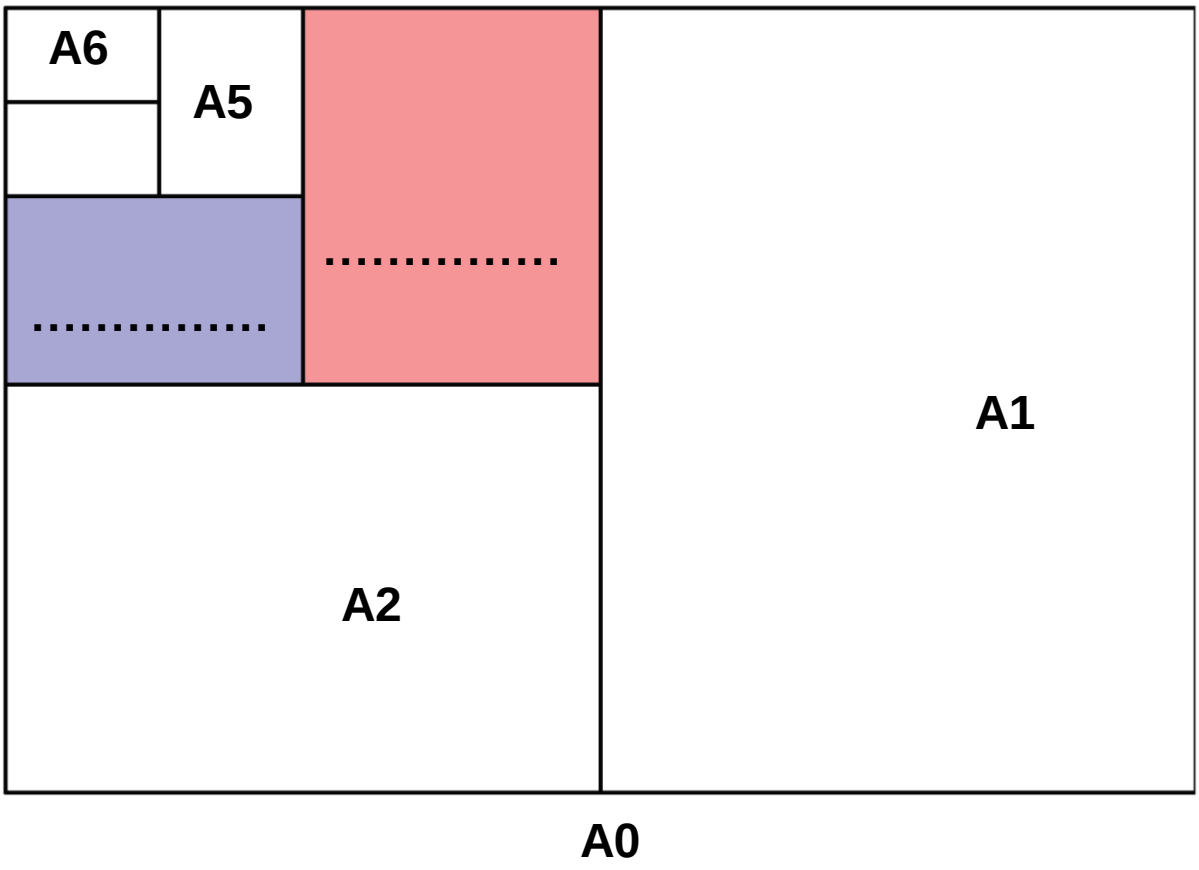
This question is about materials.

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: ……..……..……...

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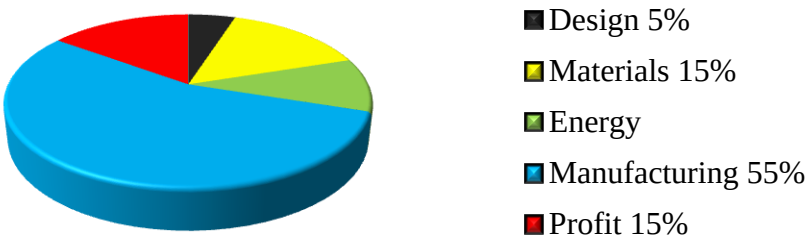
(d) The pie chart below shows a breakdown of the costs that will determine the final selling price of earphones for a mobile device.



(i) State the percentage that energy represents.

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(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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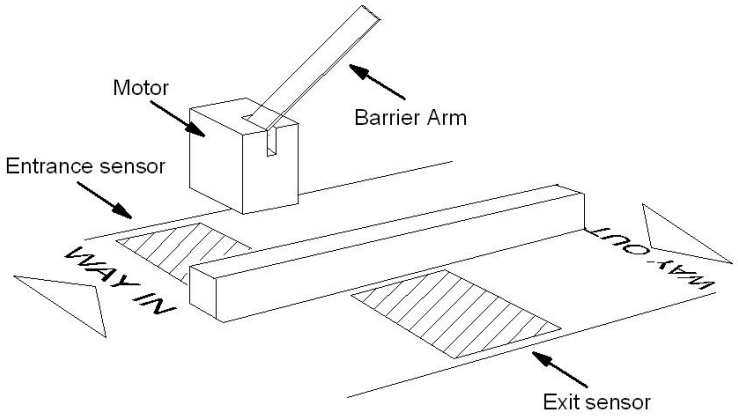
Section B

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

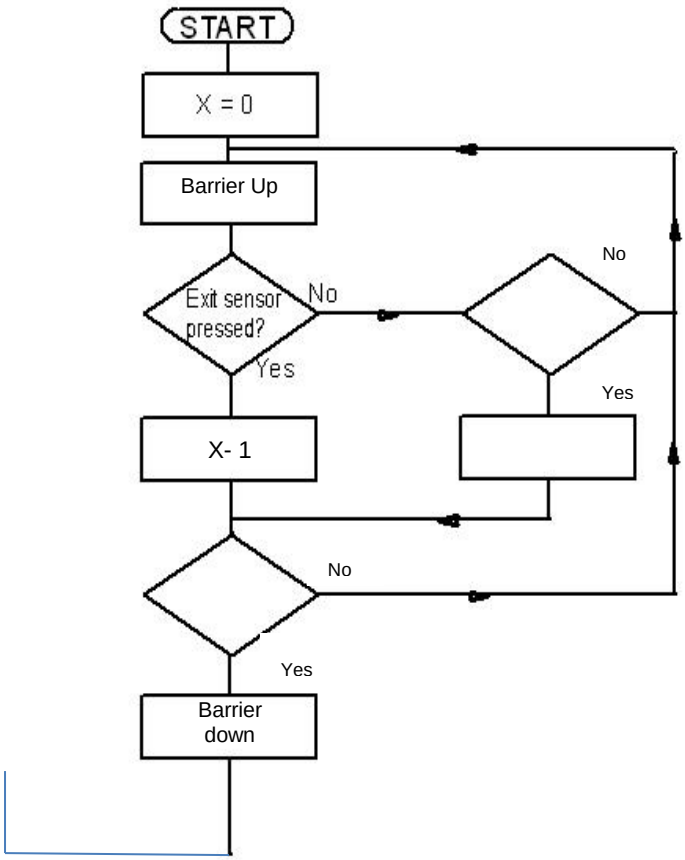
6. Electronic systems and mechanical devices

(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]

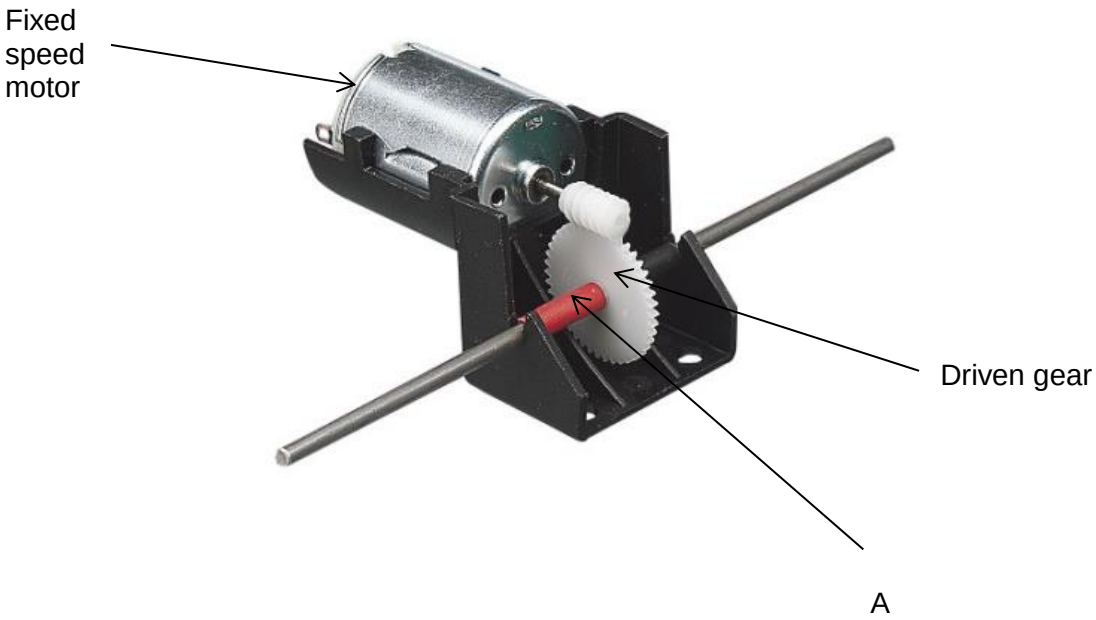


Is X = 10?

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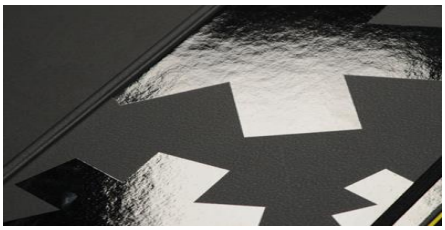
(iv) A new customer has seen the collection box and requires a high gloss UV varnish finish similar to the image below.



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

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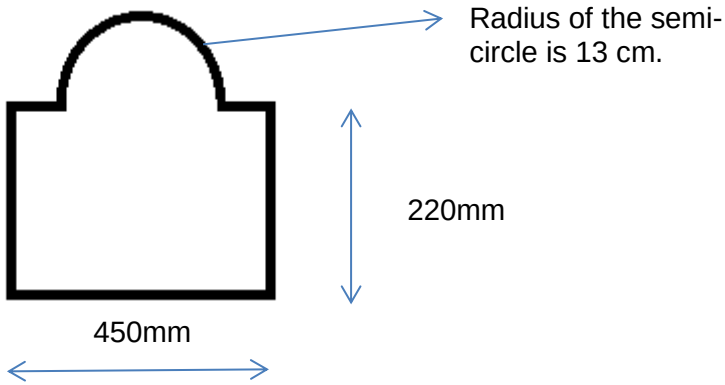
(b) Details of a modified design for the lid of the collection box are shown below.



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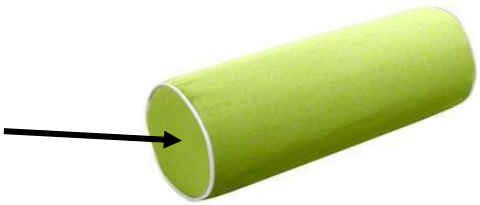
(b) The finished diameter of the circular ends on the bolster cushion is 20cm as shown below.

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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MARK SCHEME

Guidance for examiners

Positive marking

It should be remembered that learners are writing under examination conditions and credit should be given for what the learner writes, rather than adopting the approach of penalising him/her for any omissions. It should be possible for a very good response to achieve full marks and a very poor one to achieve zero marks. Marks should not be deducted for a less than perfect answer if it satisfies the criteria of the mark scheme.

For questions that are objective or points-based the mark scheme should be applied precisely. Marks should be awarded as indicated and no further subdivision made.

Banded mark schemes

For band marked questions mark schemes are in two parts, the indicative content and the assessment grid.

The indicative content suggests the range of and issues which may be included in the learner's answers. It can be used to assess the quality of the learner's response. Indicative content is **not** intended to be exhaustive and learners **do not** have to include all the indicative content to reach the highest level of the mark scheme.

In order to reach the highest levels of the mark scheme a learner need not cover all of the points mentioned in the indicative content but must meet the requirements of the highest mark band. Where a response is not creditworthy, that it contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded. For each question, descriptors will indicate the different skills and qualities at the appropriate level.

Examiners should first read and place a tick in the learner's answer/s to indicate the evidence that is being assessed in that question; the mark scheme can then be applied. This is done as a two stage process.

Stage 1 – Deciding on the band

Beginning at the lowest band, examiners should look at the learner's answer and check whether it matches the descriptors for that band. If the descriptors at the lowest band are satisfied, examiners should move up to the next band and repeat this process for each band until the descriptors match the answer.

If an answer covers different aspects of different bands within the mark scheme, a 'best fit' approach should be adopted to decide on the band and then the learner's response should be used to decide on the mark within the band. For instance if a response is mainly in band 2 but with a limited amount of band 3 content, the answer would be placed in band 2, but the mark awarded would be close to the top of band 2 as a result of the band 3 content.

Examiners should not seek to mark learners down as a result of small omissions in minor areas of an answer.

Stage 2 – Deciding on the mark

During standardising (marking conference), detailed advice from the Principal Examiner on the qualities of each mark band will be given. Examiners will then receive examples of answers in each mark band that have been awarded a mark by the Principal Examiner. Examiners should mark the examples and compare their marks with those of the Principal Examiner.

When marking, examiners can use these examples to decide whether a learner's response is of a superior, inferior or comparable standard to the example. Examiners are reminded of the need to revisit the answer as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the response provided.
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COMPONENT 1

MARK SCHEME

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
1(a)(i)		4	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] Award 1 mark for each correct step in the calculations: Cost of running traditional bulb for 1 year is 6.97 x 365 = £25.4405 (1) Cost of running LED bulb for 1 year is 1.26 x 365 = £4.599 (1) Percentage difference is 25.4405 – 4.599 = £20.8415 (1) **or** 6.97-1.26 = 5.71p (1) *20.8415 / 25.4405 × 100 = 81.9 Saving* **or** 5.71/6.97 x 100 = 81.9 saving Final answer is 81.9% accept 82% (1) *Credit any appropriate approach to calculating the costs and the saving.*	AO4 1b [1] AO4 1c [3]	**4**
1(a)(ii)	✓		Without referring to the savings shown above, explain why LED bulbs have replaced traditional light bulbs. [2] Answers must be related to the LED bulb as a replacement for traditional light bulbs. 1 mark for a reason and 1 mark for a justification or appropriate supporting comment. Traditional light bulbs have a shorter lifespan than LED bulbs (1) so the LED bulbs do not have to be replaced so frequently (1). Traditional light bulbs give off more heat than an equivalent LED bulb (1) so the LED bulb is more energy efficient (1). *Credit any other appropriate response.*	AO4 1c [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
1(b)(i)	✓		Explain **one** disadvantage of relying on wind power to produce energy. [2] Answers must be related to one disadvantage of relying on wind power to produce energy. 1 mark for a reason and 1 mark for a justification or appropriate supporting comment. Wind power is not reliable (1) as wind harnessing devices require a constant supply of wind to generate power (1). Wind harnessing devices require high initial investment costs (1) for little return if the there is insufficient wind (1). Wind harnessing devices are expensive (1) and need years of generating power to recover costs (1). *Credit any other appropriate response.*	AO4 1b [2]	**2**
1(b)(ii)	✓		Describe how installing solar panels onto a factory roof can bring benefits for a car manufacturer. [2] Answers must be related to installing solar panels on a factory roof. 1 mark for a reason and 1 mark for a justification or appropriate supporting comment. Installing solar panels on a factory roof allows the manufacturer to reduce their energy costs (1) and energy savings can increase profits (1). Installing solar panels could mean a reduction in the cost of making cars (1) this could make them more attractive to customers if the selling price is reduced (1). Installing solar panels on a factory roof could be used to increase sales by positive marketing (1). Customers may be attracted to car made by a manufacturer who has taken steps to reduce the carbon footprint of the cars they make (1). *Credit any other appropriate response.*	AO4 1a [2]	**2**
				Total	**10**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
2(a)	✓		Explain why a thermochromic smart material has been used. [3] Answers must be related to the thermochromic smart material. 1 mark for why a thermochromic material has been used, 1 mark for the explanation, 1 mark for a justification or supporting comment. The colour change in the sports training shirt is activated by heat, generated during a workout (1). Athletes in training can clearly see what muscle groups have been worked the most, as the colour change is most intense (1). Exercise routines can be amended to exercise muscles that do not have an intense colour on the sports training shirt (1). Health benefits - Could benefit those tackling obesity (1) where the change in colour could be seen as an achievement whilst exercising (1) and helps people plan effective workouts (1). *Credit any other appropriate response.*	AO4 1a [1] AO4 1b [2]	**3**
2(b)	✓		Explain why a composite material is suitable for the frame of the squash racquet shown. [2] Answers must be related to the composite materials used for the racquet. 1 mark for the benefit 1 mark for a justification or supportive comment. Composite materials have a good strength to weight ratio (1) which is useful for a squash player where the racquet is constantly hitting the ball (subject to impact/forces) and the player requires a lightweight racquet as he/she will be holding the racquet for long periods of time (1). The frame of the racquet must be able to hold the tension in the strings (1) and be able to flex without breaking if the player accidently hits the floor or wall (1). *Credit any other appropriate response.*	AO4 1c [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
2(c)	✓		Describe **one** innovative feature that makes this product appeal to potential customers. [2] Answers must be related to the innovative features of the wearable electronic device. 1 mark for an innovative feature, 1 mark for a justification or supportive comment. The phone is easily accessible to the user (1) as it doesn't have to be taken out of a pocket or bag to use it. (1). The inclusion of LED lights that flash within the holder could be an appealing safety feature (1) particularly for people who walk or run in the dark (1). *Credit any other appropriate response.*	AO4 2c [2]	**2**
2(d)			Analyse the impact that recent developments in materials technology has had on a specific named household product. [3] The answers should be related to products in the home and how they have changed with the development of material technology. 1 mark for identifying the impact of recent developments in materials technology on a household product, 1 mark for the analysis and 1 mark for a justification or supporting comment. Example could be television remotes (conductive polymers), SMART screens, infra-red cooking hobs, etc. Hand controls such as television remotes use conductive plastic polymers (1) which has also improved the battery life (1) and reduced the weight in comparison with traditional television remotes (1). *Credit any other appropriate response.*	AO3 2a [3]	**3**
				Total	**10**

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>3(a)(i)</td><td>✓</td><td></td><td>The systems approach of input, process and output is commonly used to analyse electronic and mechanical products.
Place a tick (✓) in the box to indicate the correct term for each of the statements. [2]

<table>
<tr><th>Statement</th><th>Input</th><th>Process</th><th>Output</th></tr>
<tr><td>The sound produced by a radio speaker</td><td></td><td></td><td>✓</td></tr>
<tr><td>Pressing the button on a computer mouse</td><td>✓</td><td></td><td></td></tr>
</table>

Award 1 mark for each correct tick.</td><td>AO4 1b [2]</td><td>2</td></tr>
<tr><td>3(a)(ii)</td><td></td><td></td><td>Explain why feedback is an important feature when controlling a central heating system for a house. [2]

Answers must state why feedback is an important feature when controlling a central heating system for a house (1) and provide a justification or supportive comment (1).

Feedback is important because it enables the system to switch the boiler on or off depending on whether the required temperature within a room has been achieved (1). Without feedback, the boiler would be constantly switched on or switched off irrespective of the temperature within the room (1).

Credit any other appropriate response.</td><td>AO4 1b [1]
AO4 1c [1]</td><td>2</td></tr>
</table>

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
3(b)(i)	✓	4	Calculate the rotational velocity (RV) of Pulley B when the motor connected to Pulley A rotates at 300rpm. *(Show all workings.)* [4] RV of Driver * Diameter = RV of Driven * Diameter 300 x 5 = ? x 40 1 mark 1500 = ? x 40 1 mark $? = \frac{1500}{40}$ 1 mark ? = 37.5 rpm 1 mark *Credit any appropriate approach to calculating the RV.*	AO1 1b [1] AO4 1c [3]	**4**
3(b)(ii)			Give **one** reason why this type of pulley system is suitable for the toy vehicle. [1] Answers must be related to the suitability of a pulley system in the context of the toy vehicle. 1 mark for a correct reason. It allows the vehicle to travel at an appropriate speed / provides an appropriate velocity ratio (1). The belt can be twisted to change direction (1). The belt will slip if the wheels jam (1). *Credit any other appropriate response.*	AO4 1b [1]	**1**
3(b)(iii)			State how the design of the pulley system could be changed to make the wheels go faster. Answers must be related to the design of the pulley system. 1 mark for identifying a change/modification to make the wheels go faster. The pulley system could be modified by either using a larger diameter driver pulley or a smaller diameter driven pulley (1). *Credit any other appropriate response.*	AO4 2b [1]	**1**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
3(c)(i)	✓		Describe three stages of programming a microcontroller. [3] Answers must be related to programming a microcontroller. 1 mark for each stage described, up to three. Award one mark for each correctly placed stage based on: Stage 1: Compose a program (could be in the form of lines of code or in flowchart form, could include CAD). Stage 2: Run / test the program to see if it works as required / or download onto a Micro controller IC or circuit board. Stage 3: Run / test the system to see if it works and / or edit program and repeat for new program. or Place microcontroller IC into control system and run. *Credit any other appropriate response.*	AO4 1b [1] AO4 2a [2]	**3**
3(c)(ii)			Explain **one** of the main benefits of using a programmable microcontroller. [2] Answers must be related to the benefits of using a programmable microcontroller. 1 mark for a benefit and 1 mark for a justification or supporting comment. Microcontrollers are versatile (1) because they have the ability to control numerous inputs and outputs simultaneously (1). Microcontrollers can run multiple programs simultaneously (1) and include interrupts / override features (1). Microcontrollers are small in size (1) and can reduce the number of components required and therefore size of control systems can be reduced / miniaturised (1). Many microcontrollers run off low voltage supplies (3v – 4.5v) making them energy efficient / more environmentally friendly (1) and are also reusable (1). Microcontrollers can be updated with new software to de-bug and improve performance (1) and are reusable once a product has reached the end of its useful life (1). *Credit any other appropriate response.*	AO4 1b [2]	**2**
				Total	**15**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
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] Award 1 mark for each correct answer in the correct rectangle: A4 [purple rectangle] (1) A3 [pink rectangle] (1)	AO4 1a [2]	**2**
4(a)(ii)			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] Answers must be related to the protection of the paper menu. 1 mark for a clear understanding of the process 1 mark for the description. Two appropriate processes are described below. **Laminating or print encapsulation** – The process heat seals plastic layers to the paper. The paper is placed between two sheets of plastic (polypropylene) (1) and then passed through a roller source which is heated and makes the plastic bond to itself (1). **Clear self-adhesive film or sticky back plastic** - Two sheets of film are cut to the required size. The protective layer is peeled off one of the pieces and the paper menu carefully placed into position on the sticky side of the film (1). The protective sheet on the second film is carefully peeled off and placed over the first sheet sandwiching the paper menu in the middle (1). *Credit any other appropriate response.*	AO4 2b [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
4(b)(i)			Describe **two** characteristics of aluminium that makes it suitable to be used for the drinks can below. [2] Answers must be related to **two** characteristics of Aluminium. 1 mark for **each** characteristic. Aluminium is a lightweight material (1) and has good corrosion resistance (1). Aluminium can be formed easily into the shape of a can (1) and is non-toxic to the drink (1). *Credit any other appropriate response.*	AO4 1a [2]	**2**
4(b)(ii)			Describe one benefit of making a drinks bottle such as the one shown below out of a thermoplastic material. [2] Answers must be related to the benefits of making a drinks bottle out of a thermoplastic material. 1 mark for a benefit and 1 mark for a justification of the benefit. Thermoplastics can be formed into complex shapes (1) so the manufacturer can have a distinctive design (1) The material can be recyclable (1) which is important because drinks bottles are produced in millions and not recycling the material would result in a huge amount of waste (1). Thermoplastics are available in a range of different colours (1) which can help with branding (1). Thermoplastics are ideal for mass production (1) as the production process/materials are cost effective for this application (1). *Credit any other appropriate response.*	AO4 1c [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
4(c)(i)	✓		Discuss the properties of plywood that make it suitable for use as a skateboard deck. [3] Answers must discuss the properties of plywood and its suitability for a skateboard deck. 1 mark for each discussion on the properties of plywood, up to a total of 3 marks. Due to its layered cross grain construction, plywood is strong (1) and is able to be made/laminated in a mould/former to the required shape (1). It is a suitable material to withstand the applied forces on the skateboard deck in use (1). *Candidates could make reference to any of the following properties:* • Strong; • Hard Wearing; • Flexible; • Durable; • Weather resistant when treated / suitable for external use / rain resistant; • Able to withstand the forces applied to it; • Can be shaped therefore making it ideal for the deck; *Credit any other appropriate response.*	AO4 1c [3]	**3**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
4(c)(ii)			Name the process used to create the shape of the skateboard deck in plywood. [1] Award 1 mark for a correct answer. Laminating *Accept a description of the process, for example laminating the plywood in a mould.*	AO4 2a [1]	**1**
4(c)(iii)			The skateboard wheels are made from nylon. Give **two** properties of nylon that make it suitable for the wheels. Answers must relate to **two** properties of nylon. 1 mark for each property of nylon up to a total of 2 marks. *Award 1 mark for each correct answer related to:* Hardwearing. Able to be injection moulded. Lightweight. Corrosion resistant - water. Tough - able to withstand large forces applied. Nylon will allow the wheels to run quieter than other material such as steel or a hardwood. *Credit any other appropriate response.*	AO4 1c [2]	**2**
4(c)(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] Answers must be related to skateboard deck textured surface. 1 mark for the importance of having a textured finish and 1 mark for an explanation why the whole deck is covered. The textured finish is required to allow the skateboarder to be able to grip the board (1) and the whole surface is covered because if the skateboarder does tricks they would need to be able to grip the board on whatever part of the deck they have their feet on (1). The textured finish stops the skateboarder's shoes slipping off the board (1) and the whole surface is covered so that there is good grip wherever the skateboarder's feet are placed (1). *Credit any other appropriate response.*	AO4 1c [1] AO4 1a [1]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
4(d)(i)	✓		Give **one** reason why fibres are mixed in the production of textile materials. [1] Award 1 mark for a correct answer. • To combine performance characteristics (1). • Combining properties in order to get an improved material (1). • Can reduce the cost of a material (1). • To extend materials' uses (1). • Improves the ease of care of materials (1). *Credit any other appropriate response.*	AO4 1b	**1**
4(d)(ii)			Evaluate the properties of polyester cotton that make it a suitable material for the shirt shown above. [3] Answers must relate to the properties of polyester cotton in the context of a shirt. Candidates need to demonstrate knowledge of both fibres, and then make clear judgements on the benefits of combining the properties through mixing the fibres. 1 mark for each evaluative point up to a total of 3 marks. Mixing polyester, which is quite strong, with absorbent cotton means results in an improved material with the best properties from each (1). It improves the functionality of the material (e.g. moisture absorbency) and therefore its suitability for the shirt (1). The material is hardwearing so the shirt should last a long time (1). *Candidates could make reference to:* Properties of cotton – absorbent; easy care; inexpensive; cool to wear; washable; dries quickly. Properties of polyester – durable; strong; inexpensive; crease resistant. *Credit any other appropriate response.*	AO4 1c [3]	**3**
				Total	**20**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
5(a)(i)			State the most suitable scale of production for your chosen product. [1] Answers must relate to the product selected by the candidate. 1 mark for a correct response. Suitable production methods for the products are as follows: Recycled coffee cup and sleeve Mass Metal coat and hat stand Batch Digital alarm clock Batch Modern kettle Mass Sculptural table Batch Rucksack style bag Batch	AO4 1a [1]	**1**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
5(a)(ii)			Evaluate the suitability of this scale of production for your chosen product. [3] Answers must be appropriate to the product (including the scale of production) chosen by the candidate. No marks should be credited for a repeat of part a (i). Up to 3 marks total – 1 mark for each correct evaluative comment written. **Mass Production** – relevant points include: Suitable for a product where a high volume is required, such as disposable cups (1). Less skilled work required means the cups can be made cheaply (1). Costs of set up are spread over hundreds of thousands of cups / tens of thousands of kettles (1). Good for producing cups that are all the same (consistent) (1). **Batch Production** – relevant points include: Identical stands/clocks/tables/bags can be produced (1). Changes in design can be made between batches (1). Costs of set up are spread over many stands/clocks/tables/bags (1). *Credit any other appropriate response.*	AO4 1c [3]	**3**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
5(b)(i)			Analyse your chosen product in terms of its environmental impact [2] Answers must be appropriate to the product chosen by the candidate and be specifically about its likely environmental impact. 1 mark per relevant point. The cup is made of recycled materials which is good for the environment as it is produced in huge quantities (1) As a 'use once' product, the cup is less environmentally friendly than a re-usable version (1) The metal stand should have a long life, lessening the need to use energy or material resources to replace it (1) As a basic metal product, the stand should be straightforward to recycle at the end of its life (1) The clock has a white digital display on a black background so there should be limited light pollution in a dark bedroom (1) As an electronic product, the clock should be disposed of in accordance with environmental regulations (1) Electric kettles allow the user to boil only the amount of water they need, reducing energy consumption (1) As an electrical product, the kettle should be disposed of in accordance with environmental regulations (1) The table is made in small numbers, limiting the product's overall impact on the environment (1) It would be better for the environment if the wood for the sides of the table was obtained from a sustainable source (1) The bag is made mainly from textile materials, which could be recycled at the end of its life (1) As a bold design, the bag may be a fad product that is replaced before it is worn out causing a bigger environmental impact than if it had a longer life. (1) *Credit any other appropriate response.*	AO3 2b [2]	**2**
5(b)(ii)			Evaluate your chosen product in terms of two safety considerations. [4] Answers must be appropriate to the product chosen by the candidate and give an evaluative response about the product in terms of safety considerations. The cap should fit securely to the **coffee cup** (1) so that hot liquid does not leak out when the cup is being carried (1). The sleeve is made of an insulating material (1) which does not conduct heat which could burn the user's hand / insulates the user's hand from the hot liquid (1). The **stand** should be stable when in use (1) so that it will not topple over (1). All surfaces should be smooth	AO3 2b [4]	**4**

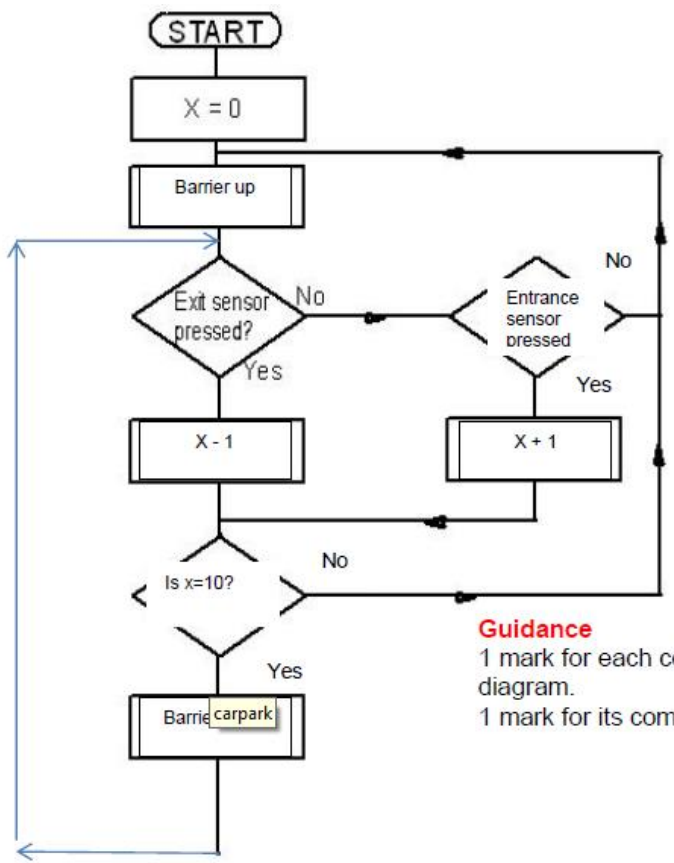
			and any protruding parts should be protected (1) stop the user getting injured or possibly cut (1). The **clock** should have approved BSI or CE marking (1) which informs the consumer that the clock design has passed all electrical safety requirements (1). The consumer should not be able to access any electrical parts when in use (1) to stop any possibility of an electrical shock (1). The **kettle** should be electrically safe (1) to stop any possibility of an electric shock (1). The body of the kettle should be made of a material that will not conduct heat (1) to stop the user getting injured or possibly dropping the liquid (1). The **sculptural table's** legs/sides must support the glass top securely (1) to help ensure the glass top does not move in use / fall off (1). The glass top should use BSI approved glass (1) to reduce the possibility of the glass breaking / injury to the user (1). The **rucksack** should be made of a material that will be strong enough to hold the expected contents (1) to reduce any possibility of the bag breaking when in use (1). All bought in components, clips etc. should be BSI/CE approved (1) to reduce the risk of the user getting injured due to substandard parts (1). *Credit any other appropriate response.*		

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
5(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] Answers must be appropriate to the product chosen by the candidate and related to design collaboration. 1 mark for the benefit and 1 mark for justification. Collaboration allows many people to contribute to the design (1) drawing upon their different expertise and perspectives so that these can be taken into consideration (1). *Credit any other appropriate response.*	AO4 2b [2]	**2**

5(c)(ii)			For your chosen product, identify a type of drawing that could be used to: (I) show your initial ideas for discussion [1] (II) show your final proposal to a potential client [1] (III) provide details for manufacture [1] Answers must be appropriate to the product chosen by the candidate. 1 mark for each correct type of drawing. *Candidates could make reference to:* (I) Sketched illustrations, rendered 2D 3D images; CAD 2D or 3D drawings, exploded drawings. (II) Presentation drawing. (III) Working drawing. *Credit any other appropriate response.*	AO4 2a [3]	**3**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
5(d)(i)		1	State the percentage that energy represents. [1] The only correct answer is 10% (1).	AO4 1a [1]	**1**
5(d)(ii)		2	If the earphones are priced at £17.50, calculate how much profit is made if 80 sets are sold. (*Show all workings.)* [2] The profit per earphone is 15%. Therefore the profit for one set of ear phones would be 15% of £17.5. $\frac{15}{100}$ x 17.5 = £2.62 1 mark 80 x 2.62 Total profit would be £209.60 1 mark *Credit any appropriate approach to calculating the profit.*	AO4 1b [2]	**2**
5(d) (iii)		2	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] 0.15 x 17.50 = 0.1365 x ? 1 mark $\frac{0.15 \times 17.50}{0.1365}$ = ? = £19.23 1 mark *Credit any appropriate approach to calculating the new selling price*	AO4 1b [2]	**2**
				Total	**20**

Section B

Q	Science	Maths	**Electronic systems and mechanical devices** Question or outline of question / Marking scheme	AO	Total
6(a)(i)			Complete the flowchart below to show control of the car park barrier, using the statements provided and any additional arrows required. [4]  **Guidance** 1 mark for each correct statement within the flow diagram. 1 mark for its completion.	AO4 2c [4]	4

Q	Science	Maths	**Electronic systems and mechanical devices** Question or outline of question / Marking scheme	AO	Total
6(a)(ii) I	✓		State the correct name of the mechanism shown. [1] Credit 1 mark for correct name. Worm and gear wheel or worm and spur wheel or worm wheel and worm gear, or worm drive.	AO4 1a [1]	1
II			Give **one** reason why this type of mechanism is suitable for the model. [1] Answers must be related to the context of the model. 1 mark for a suitable answer. The mechanism provides a big speed reduction (on the output of the motor) (1). It is easy to change the gear ratio by simply changing the gear wheel (1). The worm drives the gear wheel but the gear wheel will not drive the worm, only so motion can only be achieved by passing power through the motor (1). *Credit any other appropriate response.*	AO4 1b [1]	1
III			State **one** purpose of the component labelled A in the picture of the mechanism above. [1] Accept an appropriate answer regarding the function of the 'spacer'. The purpose of the component shown is to ensure that the gear wheel stays exactly in the required position to allow the worm to turn the gear wheel (1). *Credit any other appropriate response.*	AO4 2c [1]	1
6(a)(iii)			The mechanism has a fixed speed motor; explain why this type of motor has been used. [2] Answers must be appropriate to why this type of motor has been used. 1 mark for the reason and 1 mark for justification. The fixed speed motor is used to make sure that the gear ratio produces the correct RPM output (1). An increase in power / voltage spike will not affect the rotational velocity of the motor because it is fixed (1). *Credit any other appropriate response.*	AO4 2b [2]	2

6(b)		5	Calculate the length of the belt required for the pulley system. *(Show all workings.)* [5] Calculation of diameter of one pulley 22/7=3.14285714, (accept 3.142) x diameter = (1) 3.142 x 400 = 1,257.14mm = (1) Accept answers if the candidate has calculated half the pulley circumference and then multiplied the answer by 2. Calculation between centres Distance between centres is 400mm = (1) 2 x lengths of 400 = 800mm = (1) Total length diameter circumference 1,257.14 + 800 = 2,057.14 mm accept 2,057mm or 2m 57mm or 205.7cm = (1) *Credit any appropriate approach to calculating the length of the belt.*	AO4 1b [3] AO4 1c [2]	5

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Electronic systems and mechanical devices

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(c)</td><td></td><td></td><td>Different parts of the car park barrier system are sourced from third world countries. Analyse how this is a benefit for third world countries.

Band descriptors and mark allocations

<table>
<tr><td></td><td colspan="2">AO3 2a 5 marks</td></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse the benefits for a third world country of supplying parts of the car park barrier system. There will be evidence of relevant examples and a well-developed logical chain of reasoning, sustained throughout.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to analyse the benefits for a third world country of supplying parts of the car park barrier system. There will be some evidence of mostly relevant examples and a logical chain of reasoning, but this may not be sustained throughout.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to analyse the benefits for a third world country of supplying parts of the car park barrier system. There will be limited evidence of relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
This content is not prescriptive and candidates are not expected to refer to all the material identified below.

The benefits for third world countries include:
• it can help to improve the lives of people and communities in these countries
• it can help to reduce poverty because it offers opportunities for skilled workers to get a fair wage
• it can encourage the development of high-level skills in third world countries as the car park barrier is a complex system to manufacture
• it helps support the economy of the third world country
• it can help small businesses in third world countries to move from income insecurity and poverty to economic self-sufficiency and ownership
• It helps support employment and raising the standards of living in third world countries</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

			• the working conditions within third world suppliers can be improved by securing orders from companies based in the first world who impose their own standards on suppliers *Credit any other appropriate response.*		

Q	Science	Maths	**Electronic systems and mechanical devices** Question or outline of question / Marking scheme	AO	Total
6(d)			Evaluate how designers can lessen the impact on our environment when designing new electro-mechanical products such as the car park barrier system. [6] **Band descriptors and mark allocations**	AO3 2b [6]	6

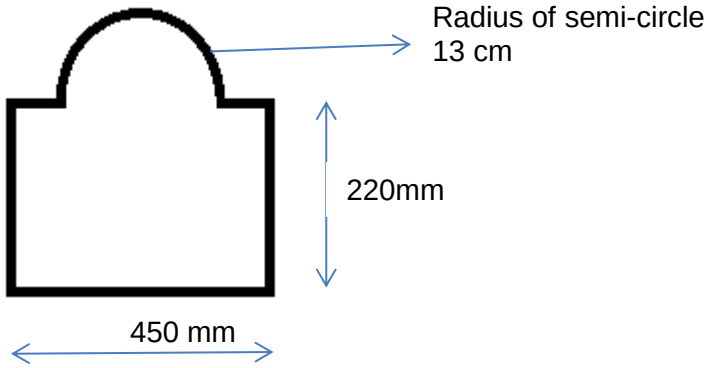
	AO3 2b 6 marks	
BAND 3	A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing electro-mechanical products such as the car park barrier system. There will be evidence of relevant examples and well-developed substantiated judgements in a response which is logically structured.	**5-6**
BAND 2	Answer has some coherence, demonstrating partial knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing electro-mechanical products such as the car park barrier system. There will be some evidence of mostly relevant examples and partly-substantiated judgements in a response which is generally well structured.	**3-4**
BAND 1	Answer demonstrates only basic knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing electro-mechanical products such as the car park barrier system. There will be limited evidence of relevant examples or judgements in a response which demonstrates little structure.	**1-2**
	Award 0 marks for incorrect or irrelevant answers	

Indicative content
This content is not prescriptive and candidates are not expected to refer to all the material identified below.

			Designers can lessen the impact on the environment when designing electro-mechanical products such as the car park barrier by: • considering how to minimise waste in manufacture of component parts of systems/products • in the case of the barrier, making the main barrier out of wood from sustainable forests • considering the amount of energy used by electro-mechanical systems, and reducing this (or eliminating it) • in the case of the barrier, reducing the weight of the barrier meaning that less energy is needed to lift it • in the case of the barrier, counter-balancing the barrier meaning that a smaller motor could be used • designing some electro-mechanical products so that operation is manual (human-powered) rather than electrical • using efficient motor(s) and gear/pulley systems to increase the efficiency of systems (reducing friction also helps) • considering renewable energy sources - in the case of the barrier, adding a solar panel could cut down on the amount of electricity that needs to be drawn from the national grid • designing products to have a long life means that replacement parts/products should not be needed for many years *Credit any other appropriate response.*		
				Total	**25**

Q	Science	Maths	**Papers and Boards** Question or outline of question / Marking scheme	AO	Total
6(a)(i) I			Explain the meaning of the word 'micron' in the sentence above. [1] Micron refers to the thickness of the boxboard.	AO4 1a [1]	1
II			Give a reason why white folding boxboard has been used for the collection box. [1] Answer should provide a reason for using folding boxboard. The candidate may refer to properties of the boxboard or its colour. *Candidates could make reference to:* Readily available material (1). Ideal for scoring (1). Ideal for folding (1). Creasing does not occur (1). Good surface finish (1). Relatively inexpensive (1). Ideal for printing colours onto the surface (1). Recyclable (1). Will last the expected lifetime of the product (1). *Credit any other appropriate response.*	AO4 2c [1]	1
6(a)(ii)			Give **one** reason why the collection box has been designed to have glue free temporary folded joints. [1] Answer should provide a reason why the boxboard has glue free temporary folded joints. *Candidates could make reference to:* Reduces cost. No need to purchase glue (1). Batches of the collection boxes can be posted flat (1). Can be assembled when required (1). Folded joints can add strength to the box (1). *Credit any other appropriate response.*	AO4 1b [1]	1

Q	Science	Maths	**Papers and Boards** Question or outline of question / Marking scheme	AO	Total
6(a)(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] Answer should explain why CAD and two different coloured lines are used. *Candidates could make reference to:* CAD allows the system to be automated sending images to the CAM machine for manufacture (1), or CAD allows for adjustments to be made easily and quickly (1). and Coloured lines indicate different machining processes (1) or, A blue line could be for scoring and a red line for cutting (1). *Credit any other appropriate response.*	AO4 2b [2]	2
6(a)(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. Answers should explain how the gloss finish is applied by UV varnishing. Accept any appropriate process and allow 1 mark for each appropriate stage up to a total of 4 marks. *Accept answers based on:* Box is placed on a conveyor belt system (1). All dust particles are removed for the board (1). (Simple jet of Air.) Board is passed under spray nozzles (1). Board is sprayed for a specific amount of time (1). Board passes under UV lights to quicken the drying process (1). Removed from the conveyor and left to dry (1). Candidates could mention parting powder applied to surface to stop the boards sticking together (1). *Credit any other appropriate response.*	AO4 2c [4]	4

Q	Science	Maths	**Papers and Boards** Question or outline of question / Marking scheme	AO	Total
6(b)		5	Calculate the area of the lid of the collection box. *(Show all workings.)* [5]  Area of the rectangle = length x breadth (1) = 450 x 220 = 99000mm^2 Radius = 13 cm = 130 mm (1) Area of the semi-circle = π x radius^2 (divide by 2 for a semi-circle) (2) = 3.142 x 130^2 = 53100 mm^2 = 26550 mm^2 Total area = 26550 + 99000 = 125550 mm^2 (1) (The candidate may have converted mm into cm.) *Credit any appropriate approach to calculating the area.*	AO4 1b [3] AO4 1c [2]	5

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Papers and Boards

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(c)</td><td></td><td></td><td>Analyse why companies based in the UK might choose to source card or paper from third world countries when making bulk purchasing decisions. [5]

Band descriptors and mark allocations

<table>
<tr><td></td><td colspan="2">AO3 2a 5 marks</td></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse why companies based in the UK might choose to source card or paper from third world countries. There will be evidence of relevant examples and a well-developed logical chain of reasoning, sustained throughout.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to analyse why companies based in the UK might choose to source card or paper from third world countries. There will be some evidence of mostly relevant examples and a logical chain of reasoning, but this may not be sustained throughout.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to analyse why companies based in the UK might choose to source card or paper from third world countries. There will be limited evidence of relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
This content is not prescriptive and candidates are not expected to refer to all the material identified below.

In purchasing papers or boards from third world countries, companies may:
- make ethical decisions based on:
• helping to improve the lives of people and communities in these countries
• helping to reduce poverty because it offers opportunities for skilled workers to get a fair wage
• supporting the economy of the third world country
• supporting employment and raising the standards of living in third world countries</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

			• a thriving card/paper production industry can help communities manage their natural resources thoughtfully (and sustainably) • larger UK companies may be able to influence working conditions within third world suppliers - make economic decisions based on: • the materials being available at a cheaper price than materials made elsewhere • papers and cards are not perishable products so they can be transported cheaply (slowly) *Credit any other appropriate response*		

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Papers and Boards

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(d)</td><td></td><td></td><td>
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.

Band descriptors and mark allocations

<table>
<tr><td></td><td colspan="2">AO3 2b 6 marks</td></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing products which include papers and boards. There will be evidence of relevant examples and well-developed substantiated judgements in a response which is logically structured.</td><td>5-6</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing products which include papers and boards. There will be some evidence of mostly relevant examples and partly-substantiated judgements in a response which is generally well structured.</td><td>3-4</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing products which include papers and boards. There will be limited evidence of relevant examples or judgements in a response which demonstrates little structure.</td><td>1-2</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
This content is not prescriptive and candidates are not expected to refer to all the material identified below.

Designers can lessen the impact on the environment when designing products which include papers and boards by:

• considering how to minimise waste in the manufacture of component parts of products
• in the case of products including papers and boards, using recycled materials where possible
</td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

			• in the case of products including papers and boards, where new material is required, ensuring this comes from managed, sustainable resources wherever possible • including information with the product to encourage recycling of paper/board (materials) after use • reducing the need for unnecessary packaging • by considering the 6 Rs – including reuse of materials • considering renewable energy sources during manufacture • designing products (even products made from paper and card) to have a long life so that replacement parts/products should not be needed for some time *Credit any other appropriate response.*		
				Total	**25**

Q	Science	Maths	**Natural and manufactured timber** Question or outline of question / Marking scheme	AO	Total
6(a)(i)			State **one** property of beech that makes it suitable for the pull-along toy wheels. [1] Candidates should state one property of beech for the wheels. *Accept answers based on:* Easily worked (1). Hard wearing (1). *Credit any other appropriate response.*	AO4 1a [1]	1
6(a)(ii)			Give **a** reason why: (I) each part of the pull-along toy has had a finish applied. [1] *Accept answers based on:* Protects the timber (1). Aesthetic- bright colours attract will attract children (1). (II) Varnish lacquer is a suitable choice of finish for the body of the pull-along toy. [1] *Accept answers based on:* The varnish lacquer will give a gloss or satin finish (1). The varnish lacquer will give a hard wearing surface (1). The varnish lacquer will make it easier to keep clean (1). The varnish lacquer will prolong the underlying colour (1). *Credit any other appropriate response for both (I) and (II).*	AO4 1b [1] AO4 2c [1]	2

6(a)(iii)			Describe how you would prepare the surface of the MDF body before applying the varnish lacquer finish. [2] The description should be about the preparation of the surface of MDF. *Accept answers based on:* Use glass paper to create a smooth surface; different graded paper, working from rough / high grit to fine lower grit; use of a sanding block. The surface of the MDF would be gently sanded using glass paper wrapped around a sanding block (1). This process would start off with a heavier graded paper before finishing with a smooth finished grade (1). The surface of the MDF would be down using glass paper (1). *Credit any other appropriate response.*	AO4 2b [2]	2

Q	Science	Maths	**Natural and manufactured timber** Question or outline of question / Marking scheme	AO	Total
6(a)(iv)			Describe a method of making four identical wheels for the pull-along toy in a school workshop. [4] A candidate should show an understanding of the method of making the wheels. Accept 1 mark for each appropriate response up to a total of 4 marks. *Accept answers based on:* *Hole cutter method* Mark out the centres (1). Set up the hole cutter on a pillar drill (1). Set the pillar drill to the correct speed (1). Secure the beech before drilling (1). Drill the holes (1). Remove the wheel blanks (1). Sand the surface to the required finish (1). Mark out the centre of the wheel for the spindle (1). *Beech dowel/rod* Mark out to the required width (1). Allow for saw cut width (1). Cut using an appropriate saw (tenon saw, hegner saw, band saw) (1). Sand the circular surface of each wheel using a sanding block or appropriate sanding machine (1). Mark out the centre of the wheel for the spindle (1). *Credit any other appropriate response.*	AO4 2c [4]	4

Q	Science	Maths	**Natural and manufactured timber** Question or outline of question / Marking scheme	AO	Total
6(b)		5	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] Area of a circle = π x radius^2 = 3.142 x 12.5^2 = 490mm^2 (2) Two circles = 490 x 2 = 980mm^2 (1) Circumference of a circle = π x 25 = 3.142 x 25 = 79mm (1) Area of the rectangle = 79 x 20 = 1580mm^2 Total surface area = 980 + 1580 = 2560mm^2 (1) *Credit any appropriate approach to calculating the area of one wheel.*	AO4 1b [3] AO4 1c [2]	5

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Natural and manufactured timber

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(c)</td><td></td><td></td><td>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.

Band descriptors and mark allocations

<table>
<tr><th></th><th colspan="2">AO3 2a 5 marks</th></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse the impact on communities and workers who benefit under the fair trade scheme. There will be evidence of relevant examples and a well-developed logical chain of reasoning, sustained throughout.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to analyse the impact on communities and workers who benefit under the fair trade scheme. There will be some evidence of mostly relevant examples and a logical chain of reasoning, but this may not be sustained throughout.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to analyse the impact on communities and workers who benefit under the fair trade scheme There will be limited evidence of relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
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The impact on communities and workers include:

• Fair Trade Foundation seeks to ensure greater equity in international trade, so workers should get paid a fair wage
• companies have better access to markets in developed countries, so workers can have better job security
• income means that there may be a reduction in poverty and improved education for children within communities
• it helps support employment and raising the standards of living in third world countries</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

			• it can encourage the development of skills in third world countries • the working conditions within third world suppliers can be improved by securing orders via the Fair Trade scheme / less exploitation of workers • it can help small businesses in third world countries to move from income insecurity and poverty to economic self-sufficiency and ownership *Credit any other appropriate response.*		

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Natural and manufactured timber

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(d)</td><td></td><td></td><td>
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.

Band descriptors and mark allocations

<table>
<tr><td></td><td colspan="2">AO3 2b 6 marks</td></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing new products which include natural and/or manufactured timber. There will be evidence of relevant examples and well-developed substantiated judgements in a response which is logically structured.</td><td>5-6</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing new products which include natural and/or manufactured timber. There will be some evidence of mostly relevant examples and partly-substantiated judgements in a response which is generally well structured.</td><td>3-4</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing new products which include natural and/or manufactured timber. There will be limited evidence of relevant examples or judgements in a response which demonstrates little structure.</td><td>1-2</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
This content is not prescriptive and candidates are not expected to refer to all the material identified below.

Designers can lessen the impact on our environment when designing new products which include natural and/or manufactured timber by:
• considering how to minimise waste in manufacture of component parts of products
• in the case of products including natural and/or manufactured timber, ensuring this comes from managed, sustainable resources wherever possible
</td><td></td><td>6</td></tr>
</table>

			• including information with the product to encourage recycling of the wood (materials) after use • reducing the need for unnecessary packaging of the product • considering renewable energy sources during manufacture • designing products to have a long life so that replacement parts/products should not be needed for some time • considering the use of natural adhesives and/or finishes for the timber *Credit any other appropriate response.*		
				Total	**25**

Q	Science	Maths	**Ferrous and non-ferrous metals** Question or outline of question / Marking scheme	AO	Total
6(a)(i)			State a property of mild steel that makes it suitable for this application. [1] A candidate should specify one property of mild steel for 1 mark. Accept answers based on: Toughness. Malleable. Lightweight. Easy to work. *Credit any other appropriate response.*	AO4 1a [1]	1
6(a)(ii)			Give a reason why: (I) the mild steel hooks need to have a finish applied; [1] Accept answers based on: Protects the surface from corrosion (1). Surface protection prolongs the life (1). Better aesthetic quality can help sell the product (1). (II) plastic coating is a suitable choice of finish for the mild steel hooks. [1] Accept answers based on: Quality of finish (1). Easy to apply (1). Will cover any sharp edges (1). Covers all surfaces and protects the surface from any possible corrosion (1). *Note – do not credit 'available in a range of colours' as that information is given in the question* *Credit any other appropriate response.*	AO4 1b [1] AO4 2c [1]	2

Q	Science	Maths	**Ferrous and non-ferrous metals** Question or outline of question / Marking scheme	AO	Total
6(a)(iii)			Describe how the plastic coating could be applied to a mild steel hook. [2] A candidate could answer this question using either of the methods indicated below. *Dip coating* The metal hook is heated to the temperature required to melt the plastic powder (1). The hook is then dipped carefully into the fluidised powder and held there for a short time before being removed and allowed to cool (1). **Or** *Spraying* The metal is sprayed with plastic powder (1) and then placed in a kiln to melt the plastic powder and then allowed to cool (1). *Credit any other appropriate response.*	AO4 2b [2]	2
6(a)(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] Award 1 mark for each appropriate marking process described, up to a total of 4 marks. Coat the metal with an appropriate metal dye (1). Scribe a line accurately using a scriber and engineers square (1). Measure accurately from the scribed line the centres of the hole and scribe the metal using a scribe and engineers square (1). Use an odd leg callipers to scribe a line along its length (1). Use a centre punch and punch the holes for drilling (1). Repeat the process for each hook (1). Accept answers that make reference to making a jig or template. *Credit any other appropriate response.*	AO4 2c [4]	4

Q	Science	Maths	**Ferrous and non-ferrous metals** Question or outline of question / Marking scheme	AO	Total
6(b)		5	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] Each hook 210 + 3 = 213mm long (1) Aluminium bar measures 1m or 1000mm Number of blanks from a 1000 bar = 1000/213 = 4 (1) 15 hook blanks required therefore number of lengths will be 4. Total cost will be 5.10 x 4 = £ 20.40 (1) Mild steel bar 2m length therefore number of blank hooks from one length = 2000/ 213 = 9 Total number of bars = 2 Total cost = 2 x 3.80 = £7.60 (1) Difference in cost = 20.40 – 7.60 = £12.80 (1) *Credit any appropriate approach to calculating the difference in costs.*	AO4 1b [3] AO4 1c [2]	5

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Ferrous and non-ferrous metals

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(c)</td><td></td><td></td><td>Analyse why consumers might choose metal products made in third world countries when making purchasing decisions.

Band descriptors and mark allocations

<table>
<tr><td></td><td colspan="2">AO3 2a 5 marks</td></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse why consumers might choose to buy metal products made in third world countries. There will be evidence of relevant examples and a well-developed logical chain of reasoning, sustained throughout.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to analyse why consumers might choose to buy metal products made in third world countries. There will be some evidence of mostly relevant examples and a logical chain of reasoning, but this may not be sustained throughout.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to analyse why consumers might choose to buy metal products made in third world countries. There will be limited evidence of relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
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In purchasing metal products from third world countries, consumers may:

- make ethical decisions based on:
• helping to improve the lives of people and communities in these countries
• helping to reduce poverty because it offers opportunities for skilled workers to get a fair wage
• supporting the economy of the third world country
• supporting employment and raising the standards of living in third world countries

- make economic decisions based on:</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

			• the metal products being available at a cheaper price than comparable products made elsewhere • metal products are not perishable so they can be transported cheaply (slowly) *Credit any other appropriate response.*		

Q	Science	Maths	**Ferrous and non-ferrous metals** Question or outline of question / Marking scheme	AO	Total
6(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] **Band descriptors and mark allocations**	AO3 2b [6]	6

	AO3 2b 6 marks	
BAND 3	A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing metal products such as the coat hook. There will be evidence of relevant examples and well-developed substantiated judgements in a response which is logically structured.	**5-6**
BAND 2	Answer has some coherence, demonstrating partial knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing metal products such as the coat hook. There will be some evidence of mostly relevant examples and partly-substantiated judgements in a response which is generally well structured.	**3-4**
BAND 1	Answer demonstrates only basic knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing metal products such as the coat hook. There will be limited evidence of relevant examples or judgements in a response which demonstrates little structure.	**1-2**
	Award 0 marks for incorrect or irrelevant answers	

			Indicative content This content is not prescriptive and candidates are not expected to refer to all the material identified below Designers can lessen the impact on our environment when designing metal products such as the coat hook by: • considering how to minimise waste in manufacture of component parts of products • in the case of products including metal, specifying recycled metals wherever possible • including information with the product to encourage recycling of the metal (materials) after use • as far as possible, ensuring that it is straightforward to separate the metal components in a product from any other materials at the end of the product's life, to encourage recycling. • reducing the need for unnecessary packaging of the product • considering renewable energy sources during manufacture • designing products to have a long life so that replacement parts/products should not be needed for some time • considering the use of environmentally friendly finishes, such as water based paints rather than oil based paints. *Credit any other appropriate response.*		
				Total	**25**

Q	Science	Maths	**Thermosetting and thermoforming plastics** Question or outline of question / Marking scheme	AO	Total
6(a)(i)			A student has designed and made a mobile phone stand as shown below. Name a suitable thermoplastic material that could be used to make the hollow base of the stand. [1] Accept any named appropriate plastic for 1 mark. Acrylic. ABS. Polystyrene (HIPS or High Impact Polystyrene). *Credit any other appropriate response.*	AO4 1a [1]	1
6(a)(ii)			Name the process used to make the hollow base of the stand. [1] Vacuum forming.	AO4 2c [1]	1
6(a)(iii)			Explain why the mould used to make the hollow base has smooth tapered sides. [2] Answers must be related to why the mould has smooth tapered sides. 1 mark for a reason and 1 mark for a justification or supporting appropriate comment. Answers could be based on: Quality of finish (1). Ease of removal from the former (1). Tapered sides stop webbing occurring (1). *Credit any other appropriate response.*	AO4 2b [2]	2

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
6(b)(i)			A protective case for a mobile phone shown below has been injection moulded. Give **one** reason why injection moulding is the most suitable choice for manufacture of the protective case. [1] Answers must be related to why injection moulding is the most suitable choice of manufacture for 1 mark. Any of the following reasons may be given: Injection moulding allows for high production output rates (1). Close tolerances on small intricate parts is possible (1). There is typically very little post production work required because the parts usually have a finished look upon ejection (1). All scrap may be reground to be reused; therefore there is very little waste (1). Full automation is possible with injection moulding (1). *Credit any other appropriate response.*	AO4 1b [1]	1
6(b)(ii)			Describe how the process of injection moulding would be carried out to make the protective case [4] A candidate should write a description of the processes, accept appropriate answers up a total of 4 marks. Basic process: White granules are selected (1). The granules are placed into a hopper (1). The granules are fed along the Archimedean spiral and heated into a plastic state (1). The Archimedean spiral forces the plastic into a split mould (1). The plastic cools and then the mould is split and the case is removed (1) The case is removed and any sharp edges removed (1). *Credit any other appropriate response.*	AO4 2c [4]	4

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Thermosetting and thermoforming plastics

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(b)(iii)</td><td></td><td>5</td><td>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]

Two cases require 65cm of wire, so….
…each case requires 65cm/2 of wire = 32.5 cm/0.325m of wire 1 mark
Each reel is 25 m long
Number of cases per reel = 25/0.325 = 76.9 = 76 cases (rounded down) 2 marks
Cost of a reel = £5.90
The unit cost of one case = 5.90/76 = 0.776 cost would be 8 pence per case 2 marks

Credit any appropriate approach to calculating the number of cases.</td><td>AO4 1b [3]
AO4 1c [2]</td><td>5</td></tr>
<tr><td>6(c)</td><td></td><td></td><td>Analyse why consumers might choose mobile phone protective cases made in third world countries when making purchasing decisions.

Band descriptors and mark allocations
<table>
<tr><th></th><th colspan="2">AO3 2a 5 marks</th></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse why consumers might choose to buy mobile phone cases made in third world countries. There will be evidence of relevant examples and a well-developed logical chain of reasoning, sustained throughout.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to analyse why consumers might choose to buy mobile phone cases made in third world countries. There will be some evidence of mostly relevant examples and a logical chain of reasoning, but this may not be sustained throughout.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to analyse why consumers might choose to buy mobile phone cases made in third world countries. There will be limited evidence of relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table></td><td>AO3 1a [5]</td><td>5</td></tr>
</table>

			Indicative content This content is not prescriptive and candidates are not expected to refer to all the material identified below. In purchasing mobile phone cases from third world countries, consumers may: - make ethical decisions based on: • helping to improve the lives of people and communities in these countries • helping to reduce poverty because it offers opportunities for skilled workers to get a fair wage • supporting the economy of the third world country • supporting employment and raising the standards of living in third world countries - make economic decisions based on: • the mobile phone cases being available at a cheaper price than comparable products made elsewhere • mobile phone cases are not perishable so they can be transported cheaply (slowly) • mobile phone cases are light in weight and small in size so can be transported cheaply. *Credit any other appropriate response.*		

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Thermosetting and thermoforming plastics

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(d)</td><td></td><td></td><td>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]

Band descriptors and mark allocations

<table>
<tr><td></td><td colspan="2">AO3 2b 6 marks</td></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing plastic products such as the protective mobile phone case. There will be evidence of relevant examples and well-developed substantiated judgements in a response which is logically structured.</td><td>5-6</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing plastic products such as the protective mobile phone case. There will be some evidence of mostly relevant examples and partly-substantiated judgements in a response which is generally well structured.</td><td>3-4</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing plastic products such as the protective mobile phone case. There will be limited evidence of relevant examples or judgements in a response which demonstrates little structure.</td><td>1-2</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
This content is not prescriptive and candidates are not expected to refer to all the material identified below

Designers can lessen the impact on our environment when designing plastic products such as the protective mobile phone case by:
• considering how to minimise waste in manufacture of component parts of plastic products</td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

			• for plastic products such as the mobile phone case, specifying recycled materials wherever possible • including information with the product to encourage recycling of the plastics (materials) after use • as far as possible, ensuring it is straightforward to separate the plastic components in a product from any other materials at the end of the product's life, to encourage recycling. • reducing the need for unnecessary packaging of the product • considering renewable energy sources during manufacture • designing products to have a long life so that replacement parts/products should not be needed for some time • where possible, specifying plastic materials that will degrade without causing environmental problems *Credit any other appropriate response.*		
				Total	**25**

Q	Science	Maths	**Fibres and textiles** Question or outline of question / Marking scheme	AO	Total
6(a)(i)			State the name of the edge finish that has been used on both cushions and give a reason for its use. [1]+[1] *Only acceptable answer for edge finish:* Edge finish: piping Accept reasons based on the following : Reason: aesthetics – looks better; adds some strength – more hardwearing; helps keep the shape of the product.	AO4 1a [1] AO4 2c [1]	2
6(a)(ii)			The main material used for both cushions is woven cotton. Give **one** reason why a woven material is the most suitable choice for these products. [1] *Accept answers based on:* • Will retain the shape of the finished cushion – i.e. doesn't stretch (1). • Easier to work with/cut out (1). • Provides a smooth surface to print on/decorate/add finishes (1). • Remains flat when cutting it out (1). • Doesn't slip when cutting it out (1). *Credit any other appropriate response.*	AO4 1b [1]	1
6(a)(iii)			Explain why it is important to lay templates out following pattern language in the construction of the two cushions. [2] *Responses could be based on:* Pattern language gives guidance on how products will fit together (1). Pattern markings tell you how to lay templates correctly on material (1). Markings followed correctly will ensure the finished product 'hangs' correctly (clothing especially) (1). Grain lines (runs parallel to the selvedge edge) should run through the middle of the pattern piece ensuring it is straight in the final piece (1). Ignoring pattern marking will lead to an inferior final product (1). *Credit any other appropriate response.*	AO4 2b [2]	2

Q	Science	Maths	**Fibres and textiles** Question or outline of question / Marking scheme	AO	Total
6(a)(iv)			Describe how you would applique the flower design onto the bolster cushion. [4] Award up to 4 marks for answers that demonstrate a clear understanding of the stages needed for appliqué. *Based on*: Method 1 - Strengthen the top piece of material (in this case the patterned flower shape) with bondaweb (1) – iron it on to the back of the flower (1); cut it out carefully following the shape (1); peel off backing paper on the bondaweb and place it on the second material (green background in this case), iron it in place (1); stitch around the edge to secure it in place (1). Method 2: Strengthen the top piece of material (in this case the patterned flower shape) with interfacing (1); pin it to the second piece (green background) and straight stitch around the flower shape (1); cut off excess material to leave the flower shape (1); stitch around the flower with a zig zag stitch covering the edge of the flower (1). *Credit any other appropriate response.*	AO4 2c [4]	4
6(b)		5	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] Diameter plus seam allowance 20cm + 3cm (1.5cm +1.5cm) = 23cm (1) 3.142 (π) x 23cm (1) = 72.3cm (1) Candidates might take π as 22/7 look for same stages with correct answer. *(Credit method based on: Radius plus seam allowance 10 + 1.5cm (1))* 5m length of fabric / 62.84.cm circumference (circumference does not include seam allowance) (1) 7 lengths (round down from 7.956) (1) *Credit any appropriate approach to calculating the circumference and the number of cylindrical sides can be cut from the fabric.*	AO4 1b [3] AO4 1c [2]	5

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Fibres and textiles

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(c)</td><td></td><td></td><td>The cushions are to be sold under the fair trade logo. Analyse the impact on communities and workers who benefit under this scheme.

Band descriptors and mark allocations

<table>
<tr><th></th><th colspan="2">AO3 2a 5 marks</th></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse the impact on communities and workers who benefit under the fair trade scheme. There will be evidence of relevant examples and a well-developed logical chain of reasoning, sustained throughout.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to analyse the impact on communities and workers who benefit under the fair trade scheme. There will be some evidence of mostly relevant examples and a logical chain of reasoning, but this may not be sustained throughout.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to analyse the impact on communities and workers who benefit under the fair trade scheme There will be limited evidence of relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
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The impact on communities and workers include:

• Fair Trade Foundation seeks to ensure greater equity in international trade, so workers should get paid a fair wage
• companies have better access to markets in developed countries, so workers can have better job security
• income means that there may be a reduction in poverty and improved education for children within communities
• it helps support employment and raising the standards of living in third world countries</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

			• it can encourage the development of skills in third world countries • the working conditions within third world suppliers can be improved by securing orders via the Fair Trade scheme / less exploitation of workers • it can help small businesses in third world countries to move from income insecurity and poverty to economic self-sufficiency and ownership *Credit any other appropriate response.*		

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Fibres and textiles

Question or outline of question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>6(d)</td><td></td><td></td><td>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]

Band descriptors and mark allocations

<table>
<tr><td></td><td colspan="2">AO3 2b 6 marks</td></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing textile products. There will be evidence of relevant examples and well-developed substantiated judgements in a response which is logically structured.</td><td>5-6</td></tr>
<tr><td>BAND 2</td><td>Answer has some coherence, demonstrating partial knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing textile products. There will be some evidence of mostly relevant examples and partly-substantiated judgements in a response which is generally well structured.</td><td>3-4</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to evaluate how designers can lessen the impact on the environment when designing textile products. There will be limited evidence of relevant examples or judgements in a response which demonstrates little structure.</td><td>1-2</td></tr>
<tr><td></td><td colspan="2">Award 0 marks for incorrect or irrelevant answers</td></tr>
</table>

Indicative content
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Designers can lessen the impact on our environment when designing textile products by:
• considering how to minimise waste in manufacture of textile products
• for the product in question, considering whether using natural or synthetic textiles will have the least impact on the environment (response could also refer to sustainability)
• considering the use of natural finishes/dyes where appropriate</td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

			• if the product contains materials in addition to textiles, ensuring as far as possible that it is straightforward to separate the textile components from any other materials at the end of the product's life, to encourage recycling. • reducing the need for unnecessary packaging of the product • considering renewable energy sources during manufacture • designing textile products to have a long life so that replacements should not be needed for some time (recognising that fashion/fads can impact here) *Credit any other appropriate response.*		
				Total	**25**

GCSE

DESIGN AND TECHNOLOGY

COMPONENT 2

CONTEXTUAL CHALLENGE

SAMPLE ASSESSMENT MATERIALS

01 June 2016

Duration approximately 35 hours

A defining feature of design and technological activity is that it is context dependent, as are the outcomes of such activities.

The role of the contextual challenge is to provide an external stimulus for learners, from which they will explore and clarify design problems and opportunities. This will lead to the development of their own design briefs, which will inform and direct their designing and making activities.

Learners will be assessed on their ability to analyse and respond to contexts, rather than their knowledge of specific contextual areas.

Learners are required to select **one** of the following contexts as the basis of their design and make task:

- **Sustainability and our future needs**

  Look at an everyday product and consider how it could be redesigned using recycled or waste materials.

- **Improving the daily life of elderly people**

  Look at the specific needs of elderly people and design a unique product that would support their everyday lives.

- **Outdoors pursuits and physical fitness**

  Look at outdoor activities and physical fitness and consider the needs and wants of people who do such activities.