GCSE MARKING SCHEME

SUMMER 2019

DESIGN AND TECHNOLOGY - COMPONENT 1
C600U10-1

INTRODUCTION

This marking scheme was used by WJEC for the 2019 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE DESIGN & TECHNOLOGY

COMPONENT 1: PRODUCT DESIGN

SUMMER 2019 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 provide.

Section A

Answer **all** questions

This question is about the lifecycle of products.

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
1. (a) (i)		1	State the percentage of clothes that are sent to landfill. [1] Only acceptable answer for percentage of clothes sent to landfill: 31% (1)	AO4 1b [1]	**1**
(ii)	✓	1	Calculate the percentage of clothes that were incinerated and sent to landfill. [1] Only acceptable answer for percentage of clothes that were incinerated and sent to landfill: 38% 7% (incinerated) + 31% (landfill) = 38% (1).	AO4 1c [1]	**1**
(iii)	✓	2	If all the clothes that were incinerated and sent to landfill were recycled, how much of the £1800 would be spent on recycling. *(Show all workings).* [2] Award 1 mark for each correct step in the calculation: 7% (incinerated) + 31% (landfill) + 14% (recycling) = 52% (1). £1800 / 100 x 52% = £936 (1). *Credit any appropriate approach to calculating the total cost of clothes that could be recycled.*	AO4 1c [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(iv)	✓		Explain the meaning of the term 'carbon footprint'. [2] 1 mark for correct definition of carbon footprint (1), 1 mark for reference to recycling process or product (1). Carbon foot print is the measurement/amount of greenhouse gases produced in the production of products (1). Some recycling products (e.g. plastic bottles), may still require 'activity'/use of energy in production which emits further greenhouse gases (1). A carbon footprint is the CO2 that ends up in the air/atmosphere because of human activities (1) by recycling, (e.g. clothes in a charity shop) there becomes a reduction in energy used in its disposal (1). *Credit any other appropriate response.*	AO4 1b [1] AO4 1c [1]	**2**
(b) (i)			The diagram below shows a typical product life cycle. Explain what happens during the decline stage. Answers must relate to the 'decline' stage of the Product Lifecycle. 1 mark for each point explained, up to two required. Sales of the product are declining (1). Market demand for the product is not increasing (1). As people will already own the product (1) Investment in the products development is now minimal (or not at all) (1). The product may still be sold (within the market) but it isn't as popular or fashionable as it once was (1). Profit in the company may still be made even though the sales of the product have declined due to increased sales of other, more popular products sold by the company (1). Planned obsolescence (1) *Credit any other appropriate response.*	AO4 1b [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(ii)			Many products end up in landfill sites. Explain the impact this has on the environment. [2] Answers must relate to sustainability. 1 mark for each point described, up to two or 1 mark for an example and 1 mark for clear reason. Products increase landfill (1) which leads to an increase in greenhouse gases (1), methane gas (and or carbon dioxide (CO_2)) (1). Landfill releases liquids like leachate (1) which can contaminate water sources (1). Many materials that end up as waste contain toxic substances (1) which over time leach into our soil and become a hazard to our eco system/natural life (1). Products are often made from non-renewable sources (e.g. plastics) (1) which do not biodegrade easily (1) and so increase toxic substances entering our food chain (1) and increase greenhouse gases produced in degrading (1). Deforestation (1). Air pollution (1). *Credit any other appropriate response.*	AO4 1a [2]	**2**
				Total	**10**

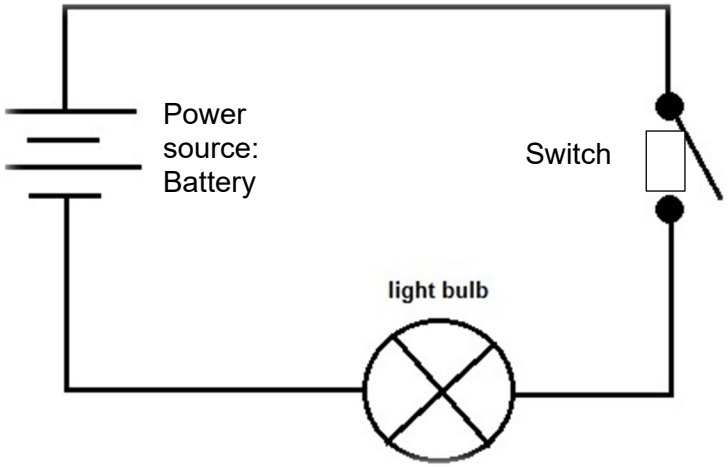
This question is about materials technology.

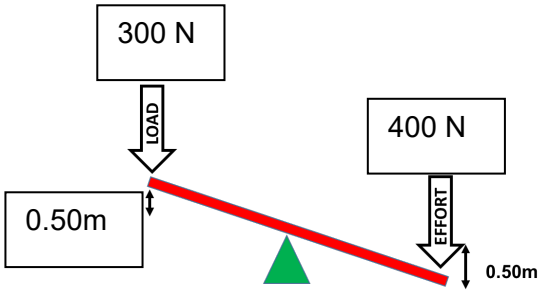
Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
2. (a)	✓		The sportswear images below have been made from a material called Rhovyl. Describe the properties of this material for its use in sportswear. [3] Answers must be related to the Rhovyl material. 1 mark for why a Rhovyl material has been used (property), 1 mark for the explanation, 1 mark for a justification or supporting comment. If two properties have been stated with good justification, full marks can be awarded. NOTE: there are a number of Rhovyl materials that do have a range or properties or a combination of properties. Rhovyl is an anti-bacterial material/fibre (1) which improves the hygiene and comfort of the wearer (1). It is particularly suited to those who play sport or undertake physical exercise (1) as it prevents body smells and minor infections (1). Rhovyl has moisture wicking properties (1) which help keep the wearer dry (1) this increases the comfort of the product (1). Rhovyl is a synthetic fibre that is soft and breathable (1) but it also has good insulation properties (1) keeping the wearer both warm/insulated but allows the skin to breathe maintaining dryness (1). Rhovyl is durable as it can be worn and washed many times (1). Rhovyl dries quickly (1). Rhovyl is a very stretchy material (1). <u>Other facts:</u> The antibacterial substance is added to the fibre (1), it does not wash out so the properties of the material are maintained (1). It is good for allergy sufferers (1) as it has proven to remove/kill dust-mite (1). *Credit any other appropriate response.*	AO4 1a [1] AO4 1b [2]	**3**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(b)	✓		A blend of Nomex and Kevlar is used to manufacture the fabric of a fire-person's uniform as seen in the picture below. Explain the advantages of blending these fibres together. [2] Answers refer to the properties of *both* fibres and to the outfit to gain full marks. 1 mark for each complementary property that relates to firepersons outfit. Maximum of one mark without any explanation of one property. Nomex is a flame-resistant material needed to protect the user against a fire (1) Kevlar thermally protects the user from the fire (1). Nomex is a durable/tough material to withstand active use (1) Kevlar is tear resistant adding to the durability of the material/product (1). Nomex is a flexible material and Kevlar is light in weight both help the user move quickly and easily (2). *Credit any other appropriate response.*	AO4 1c [2]	**2**
(c)	✓		The cutlery handle below has been formed using Polymorph pellets. Describe how the Polymorph pellets are used to make the cutlery handle. [2] Two stages describing the processing of Polymorph pellets are required for full marks. I mark per stage described. Polymorph granules/pellets are heated in water (only) to over 62°C (1). The granules/pellets soften in the water and they turn transparent (1). The granules/pellets are removed from the water and moulded (by hand) to form a cutlery handle (1). The polymorph is left to cool until solid (1). The moulded polymorph can be re-heated if further moulding is required (1). *Credit any other appropriate response.*	AO4 2c [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(d)	✓		Polymorph is classed as a smart material. Analyse how the use of a different smart material in a product, could be a safety or warning feature to the user. [3] The answers should be related to products/materials that improve the safety of people. 1 mark for a product/material example, 1 mark for the analysis and 1 mark for a justification or supporting comment. Plastic thermochromic spoons change colour on heat/temperature (1) which are useful for judging the temperature of baby's food. The change in colour identifies the food is too hot (1) so helps ensure the baby doesn't get a burnt mouth (1). Safety examples: thermochromic spoons, plugs, mugs, food bowls, all change colour when they come in to contact with hot foods/liquid; plastic thermometers for forehead use (replacing glass/mercury); food packaging materials to show when a product they contain is cooked to the right temperature (prevents food poisoning), photochromic t-shirt that changes colour when UVA/B/sunlight can burn skin (preventing skin cancer in later life); a 'smart' dressing which illuminates as it releases bug-busting antibiotics into wounds. Students may also refer to interactive textiles for example, fitbit, if related to safety (e.g. indicating when to stop exercising as blood pressure is raised), credit should be given. For example: Plastic thermometers are used to record temperatures on children's foreheads (1), they cannot break, like glass thermometers (don't contain deadly mercury) (1) so are safer to be used with children (1). Photochromic t-shirts are impregnated with a smart dye (1) that changes colour when UVA/B sunrays are at a dangerous level (1) reminding the wearer to add sun cream to their skin, preventing burning (1). Smart dressings/bandages are filled with/encapsulated with antibiotic drugs (1) that are triggered by the presence of bacteria, treating the infection (1) before it can take hold and preventing the person getting seriously ill (1). The bandage changes colour as the medication is triggered alerting medical staff there is an infection in the wound (1). *Credit any other appropriate response.*	AO3 2a [3]	**3**
				Total	**10**

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

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
3. (a) (i)	✓		The folowing is a diagram of a simple circuit. On the circuit diagram above, label the power source and the switch. [2]  Award 1 mark for each correct answer.	AO4 1b [2]	**2**
(ii)			The image below shows a modern street light. Explain how LDRs (Light Dependant Resistors) work in modern street lighting. [2] LDRs (light-dependent resistors) are used to detect light levels in the street (1). Their resistance decreases as the light intensity increases (1). In the dark and at low light levels, the resistance of an LDR is high (1), and little current can flow through it (1). In bright light, the resistance of an LDR is low (1) and more current can flow through it (1). Turning on the street light (1). *Credit any other appropriate response.*	AO4 1b [1] AO4 1c [1]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(b) (i)	✓	4	This question is about mechanical advantage and velocity ratio calculations. Study the picture below before answering the questions that follow.  Calculate both the mechcanical advantage and velocity ratio of the seesaw. *(Show all workings)* 2x[2] Mechanical Advantage: Load / Effort 300N / 400N (1) = 0.75 (1) Velocity Ratio: Distance moved by effort / Distance moved by load 0.50m / 0.50m (1) = 1 (1) *Credit any appropriate approach to calculating the MA and VR.*	AO1 1b [1] AO4 1c [3]	**4**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(ii)	✓		Explain what is the role of the fulcrum in the seesaw. [1] Answers must be related to the seesaw. 1 mark for a correct reason. The role of the fulcrum is of a pivoting point around which a lever 'turns' (1). The fulcrum is the point where the load is pivoted (1). *Credit any other appropriate response.*	AO4 1b [1]	**1**
(iii)	✓		State what would happen if you changed the position of the fulcrum. [1] Answers must be related to the position of the fulcrum. 1 mark for reference correctly of mechanical advantage and/or velocity ratio. For example: If the fulcrum moves closer to the effort end, the mechanical advantage decreases (1) and more effort (1) is needed to move the same load. If the fulcrum moves closer to the load end, the mechanical advantage increases (1) and less effort (1) is needed to move the same load. Balance point will change (1). *Credit any other appropriate response.*	AO4 2b [1]	**1**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(c) (i)	✓		Describe **the** difference between a microprocessor and a microcontroller. [3] Answers must be related to a microprocessor and a microcontroller. Up to three marks can be awarded for a clear description identifying a difference between microprocessors and microcontrollers. Two marks can be awarded if the difference is correct but the description is not clearly written. A microprocessor is at the centre of a computer system whereas a microcontroller is at the centre of an embedded system (3). A microprocessor cannot be used in compact systems and hence is inefficient, a microcontroller can be used in compact systems and hence it is an efficient system (3). Due to external components, the entre power consumption is high in microprocessors whereas the external components in a microcontroller are low, total power consumption is less (3). A microprocessor functions at high speed, and microcontroller functions at low speed (3). A microprocessor has a higher power consumption than a microcontroller which has a lower power consumption (3). Not all microprocessors have power saving features, microcontrollers do have power saving modes to help reduce power consumption (3). The 'designer' or 'user' decides on the amount of ROM, RAM and I/O ports with a microprocessor whereas a microcontroller has a fixed amount on on-chip ROM, RAM and I/O ports (3). A microprocessor has no internal memory whereas a microcontroller does contain internal memory (3). A microprocessor has no interfacing circuits, timer and counters (they are separately interfaced) whereas a microcontroller does, (they are all on a single chip) (3). A microprocessor is used for general purpose applications for example, laptops and P/Cs, whereas a microcontroller is used for specific purpose applications, for example, a digital camera, a washing machine (3) *Credit any other appropriate response.*	AO4 1b [1] AO4 2a [2]	**3**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(ii)			Explain **one** disadvantage of using a programmable microcontroller. [2] Answers must be related to the limitations of using a programmable microcontroller. 1 mark for a limitation and 1 mark for a justification or supporting comment. Some microcontrollers, are custom programmed for custom-built machines (1) so can be extremely expensive (1). If custom-built, regular maintenance will be required which can be costly (1). Microcontrollers cannot interface high power devices directly/can't handle a large amount of information (1) performing only a limited number of executions simultaneously (1). A microcontroller can't withstand dust (1) or work in environments with high levels of humidity (1) this limits usage (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)			The image below shows corrugated cardboard which is used in packaging. The weight of paper and cardboard is measured in gsm. State the full meaning of gsm. [1] *Only acceptable answer for gsm is :* **G**rams per **S**quare **M**etre	AO4 1a [1]	**1**
(ii)			State how the structure of corrugated cardboard makes it suitable for packaging. [1] Award 1 mark for correct answer. A correct factual answer is sufficient to be awarded the 1 mark. For example: The construction of the liners and fluting forms a series of connected arches which become impact resistant (1). Shock absorber (1). Strength (1). Light in weight (1). Corrugated board is made from a combination of two sheets of paper (called **liners)** glued to a corrugated inner medium called the fluting. These three layers of paper are assembled in a way which gives the overall structure a better strength than that of each distinct layer.	AO4 1a [1]	**1**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(iii)			Describe a disadvantage of corrugated cardboard when used to make models. [2] Answers must be related to corrugated board. 1 mark for a disadvantage and 1 mark for a link to its use in model making. For example: It is difficult to create neat folds in corrugated board (1), the inner layers will dictate the shape of the fold (1) which are not always in the direction wished for when modelling (1). Due to its internal structure, corrugated card has a rough, ridged appearance that is prone to wrinkling and bending (1), which is only good for modelling where resilience is not required (1). Corrugated board has a dull appearance; Corrugated board has an untidy appearance when cut, making the model's aesthetic appearance poor; Mass of corrugated board is air, with sideways pressure it will bend and pucker/crumble; Corrugated board will soften and become pulpy in ambient moisture environments; It can be difficult to get the angle perfect when cutting corrugated board because of its layered construction (1). Corrugated board is brown in colour/appearance (1) which is not a desirable aesthetic finish if this is an important criterion of the product modelling (1). *Credit any other appropriate response.*	AO4 2b [2]	**2**
(b) (i)			Label the **two** most suitable materials used to manufacture the saucepan pictured below. 2 x [1] Answers must be appropriate to the material suitable for the (modern) saucepan and its handle. The saucepan must be a metal/alloy, the handle must state a named thermosetting plastic. Saucepan: stainless steel, copper, aluminium. Handle: PR (polyester resin), Urea formaldehyde, phenol formaldehyde and ER (epoxy resin). *Credit any other appropriate response.*	AO4 1a [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(ii)			Discuss the working properties of **one** of the materials identified in (i) above that make it suitable for the saucepan. [2] Answers must be related to the chosen material named. 1 mark for a benefit and 1 mark for a justification of the benefit. For example: Epoxy resin is a thermosetting plastic that resists heat up to 250 degrees centigrade (1) which means it can be used both on the hob and in the oven without deforming (1) Stainless steel – hard and tough, resists wear, corrosion resistant, good conductor of heat, doesn't taint food stuffs. Copper – good conductor of heat, corrosion resistant, polishes well, doesn't taint food stuffs. Polyester resin – good chemical and wear resistance, resists heat to 250C, electrical insulator, takes colour well (aesthetics). Epoxy resin – good chemical and wear resistance, resists heat to 250C, electrical insulator. *Credit any other appropriate response.*	AO4 1c [2]	**2**
(c) (i)	✓		The picture below is of a radiator cover and it is made from MDF. State the full meaning of MDF. [1] *Only acceptable answer to define MDF:* **M**edium **D**ensity **F**ibreboard (1)	AO4 1a [1]	**1**
(ii)			Name a piece of CAM (Computer Aided Manufacture) equipment that could have been used to create the pattern on the radiator cover. [1] Award 1 mark for a correct answer. Laser Cutter (1) CNC Router Machine (1)	AO4 2a [1]	**1**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(iii)			Discuss the reasons why MDF is such a versatile material in the construction of products such as the radiator cover. [4] Answers must relate to two properties of MDF. 1 mark for each property of MDF and 1 mark for justification or supporting comment, up to a total of 4 marks. A maximum of three marks can be awarded if three correct properties are stated without a supporting comment. Note: his question is about construction and not finish, no awarded mark can be given if reference is made to the range of finishing available for MDF. Some examples: MDF in comparison to other timbers is made of fine particles (1) so no recognisable surface grain is visible as with other timbers (1). MDF is thicker, denser and heavier than hardboard (1), can be cut, drilled and machined without damaging the surface (1) which means it has more product versatility than any other timber (1). As MDF is unaffected by humidity (1) it doesn't swell or buckle like other timbers giving it a larger range of uses inside the home. *Award 1 mark for each correct answer relating to:* MDF is thicker, denser and heavier than hardboard; MDF has no knots and is therefore easier to machine and finish; MDF is made of fine particles so no recognisable surface grain is visible – has a smooth face; MDF can be cut, drilled, machined and filed without damaging the surface; It is very stable and unaffected by humidity; It is a good electrical insulator; MDF can be dowelled together and traditional woodwork joints can be cut; MDF may be glued together with PVA wood glue; Veneers and laminates may also be used to finish MDF. MDF has good stability when exposed to changes in temperature. MDF is available in a variety of thicknesses. MDF is reasonably cost effective. *Credit any other appropriate response.*	AO4 1c [4]	**4**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(iv)			Explain, using an example, how the aesthetic qualities of MDF can be improved. [2] Answers must be appropriate for MDF. 1 mark for the example of an appropriated finish and 1 mark for an explanation why the finish is suitable. MDF can be painted with any form of coloured paint (acrylic or enamel) (1), and priming the surface is not necessary a requirement speeding up the finishing process (1) Examples: Paint – brush, roller, spray, glazing, distressing Varnish Natural oils Wood stains Wood veneers *Credit any other appropriate response.*	AO4 1c [2]	**2**
(d) (i)	✓		Below is a picture of a jumper manufactured from a *natural animal* polymer. Name the natural polymer used to manufacture this jumper. [1] Award 1 mark for a correct answer. • Wool (1) • Cashmere (1) Note: Alpaca, camel and mohair are natural animal polymers (listed in the specification) but are not appropriate for the image provided and should not be awarded a mark if stated by the student.	AO4 1b	**1**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(ii)	✓		Describe why the jumper has been knitted and made from a natural animal polymer. [3] Answers must relate to the properties of wool/cashmere in the context of a jumper. Candidates need to demonstrate knowledge of wool fibre or knitted structure. Disadvantages of using wool as a fibre for this item of clothing could be referenced as part of the evaluation discussion. 1 mark for each evaluative point up to a total of 3 marks. Two reasons described can be awarded full marks. Wool is an excellent insulation as it keeps heat close to the body trapping (1) it between the fibres which have crimp (1) Wool can easily absorb (up to 30% of its weight) moisture without feeling damp as it wicks moisture away from the body, keeping the person warm and dry (2). Wool functions as a "temperature regulator" so it can protect the body in both cold and warm conditions (2). To a certain degree, wool is considered water repellent. (Small amounts of liquid, such as spills, light rain or snow, will stay on the surface or run off the fabric) and thus continue to keep the wearer warm (2). Wool keeps you "warm when wet" (since it retains 80% of its insulating value even when saturated) (2). Wool does dry slowly which when saturated fully will not be a good insulator as the body will become wet (2). *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)			Most products are designed with more than one function in mind. State the main function of your chosen product. [1] Answers must relate to the product selected by the candidate. 1 mark for a correct response. Main function for each product is: Drinks carton – to protect content; to increase shelf life of contents. Bag for Life – to carry shopping securely. Watch with metal strap – to tell the time; to fit a range of users/wrist sizes (easily removable sections). Under bed boxes – to store content safely, to protect contents; to increase storage in the home. LED Head torch – to see - hands free - in the dark; to direct a strong beam of light; energy efficient light. Veneer packaging – to protect contents; to package content in an aesthetic way. *Credit any other appropriate response.*	AO4 1a [1]	**1**
(ii)			Analyse how the material used makes your chosen product sustainable. [2] Answers must be appropriate to the product chosen by the candidate. Up to 2 marks total - 2 reasons given that link to sustainability that are well analysed. Positive and negative effects both accepted. Drinks carton – can be fully recycled; made from recycled materials; can be squashed easily for ease of recycling; uses foil lining which is recyclable, however not all councils recycle this material; Forest Stewardship Council certified; made from waterproofed card which can be reused, for example, cut top off to grow herbs in; only a good sustainable product if recycled by the consumer; will biodegrade faster than many other materials.	AO4 1c [2]	**2**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
			Bag for Life – made from plant fibres which are renewable as a material source; last much longer than plastic (HDPE) bags and are not found in the sea/water ways that destroy eco system; can be made from waste fibres; can be made from recycled material; can be recycled; however, produces a lot of carbon waste in production (growing, manufacturing, transportation); only a good sustainable product if used for years; fabric can tear with wear/use resulting in an un-usage product. Watch with metal strap – stainless steel – means it has a long life; lasts longer then, and is more environmentally sound than, rubber/plastic; highly durable; easily recycled; recycling stainless steel uses far less energy than creating new sheets of steel; can be recycled into many other products so is highly versatile for recycling; however, is not a biodegradable material. Under bed boxes – extremely durable so has a long life; can be made from recycled materials; is fully recyclable and can be made into many other products so highly versatile for recycling. Polypropylene has a low density (reduced amount of waste) in manufacture so reduces environmental impact; polypropylene produces lowest CO2 emissions in manufacture than any other plastic; however, any plastic is made from non-renewable a resource which has a negative impact on environmental sources; plastics are not a biodegradable material. LED Head torch – any answer based on the whole product or part of the product is acceptable. LEDs have a long life, (although performance does degrade over time) LEDs are robust; LEDs are efficient as they have low power consumption; LEDs don't produce heat; all of which increases the life of the headtorch, reducing landfill or the need to repurchase. Reference to the head torch strap may refer to synthetic material (e.g. nylon), which is recyclable although uses fossil fuels for its manufacture. Veneer packaging – supported by the FSC; veneers can be made from recycled wood products; no waste is created when producing veneers; using a veneer reduces the quantity of wood, reducing tree felling; can be recycled; wood is a naturally sustainable product as it has less impact on energy, air and water pollution; produces a beautiful product, ensuring consumers do not discard; packaging box has a variety of uses so is easily recycled/reused; not a durable as other materials for packaging/storage. *Credit any other appropriate response.*		

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(b) (i)			Collecting primary and secondary source research is required to ensure client and user needs are identified and met when designing. Describe, using examples, the differences between primary and secondary source research. [3] Award 2 marks for identifying clearly the *difference* between primary and secondary research. 1 mark can be awarded for stating a correct example of a primary and/or secondary research task. Primary research involves gathering new data that has not been collected before (1) for example interviewing groups of people in a focus group (1) whereas, secondary research involves gathering data that already exists having been founded by another party (1), for example researching the internet (1) or newspaper articles. *Credit any other appropriate response.*	AO3 2b [3]	**3**
(ii)			Evaluate how successful your chosen product is in terms of its ergonomic design. [4] Answers can relate to any aspect of ergonomic design to include appearance and anthropometrics but must be appropriate to the product chosen by the candidate and an evaluative response (advantages and disadvantages) about the product is given. Each advantage and/or disadvantages should be awarded 1 mark. Each advantage and/or disadvantage should be justified and linked to the product chosen, 1 mark. A maximum of 2 marks can be gained for just advantages/disadvantages without justification/reasoning. For example: The drinks carton is a suitable shape (1) so that it can fit easily into a fridge for storage (1). It is also the correct size to be held in the hand of a child for ease of use (1) and it has been designed to prevent spillage in use by attaching a straw (although insertion needs good fine motor skills which may be seen as a disadvantage) (1). Colours and design are attractive to appeal to target market (1).	AO3 2b [4]	**4**

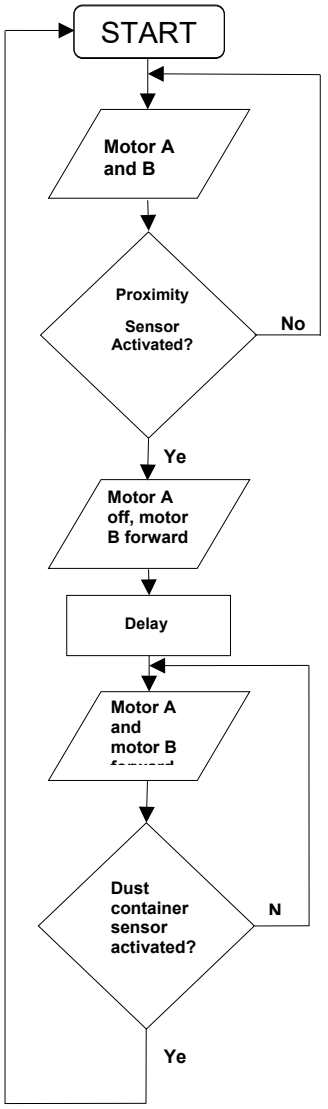
Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
			The ergonomic design comments could reference any of the following: Drinks carton – size relevant to fridge compartment for ease of storage; size relevant to ease of handling; straw design to prevent liquid spillage in use; reference may be made to print design (even though not on show) that references contents, for example colours used to identify ingredients, however, it has only been designed for child use and could be seen as a cumbersome shape to be held in the hand securely by an adult, i.e. not a cylinder. Bag for Life – designed to be 3D for more economical storage of shopping; handle length has been calculated based on adult sizing and is suitable for carrying both in hand or on shoulder; colours used are suitable for both genders; the width and length of the bag has been anthropometrically calculated to ensure no strain or back injury occurs with over packing of shopping. Watch with metal strap – strap designed to fit around wrist securely; designed with a number of links which can be removed for a suitable fit; not gender specific; watch face correct size for vision and ease of reading; tells both time and date; however, could be bulky on wrist; strap made from metal which may be heavy for wearer. Under bed boxes – designed to be the correct depth to fit under a bed; designed to be the correct length so more than one can be fitted neatly under a bed; designed with wheels to ensure ease of use; designed with a flap opening for ease of access when in situ; however, may not fit neatly under all bed sizes, for example single and double; although hidden under bed, not aesthetically attractive. LED Head torch – strap adjustable to fit a range of head circumference securely; padded for comfort; anthropometrically designed to not be too big to fit forehead; light in weight; strap stretches for comfort and fit; strap soft to handle for comfort; however is a bulky item. Veneer packaging – fastening has been designed for ease of use (and is aesthetic in design); however, candidates may state it is a fiddly design and is not easy to open and close as a packaging fastening; a range of sizes have been designed to suit a range of users and products; edges have been rounded for safe use; sizes mean they are not stackable, this could be seen as a disadvantage. *Credit any other appropriate response.*		

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(c) (i)	✓		Explain why a user-centred design approach is so important for the successful design of your chosen product. [2] Answers must be appropriate to the product chosen by the candidate and related to a user-cantered design approach. 1 mark for the correct understanding/definition of a user-centred design approach and 1 mark for relating it to the chosen product. A user-centred design approach ensures end users are consulted throughout the design and development of the product (1). This would ensure the **drinks carton** contains the information most needed by the consumer (1). This would ensure the **bag for life** is appealing for both male and female shoppers and not just focusing on the one gender (1). This would ensure the **watch with metal strap** is easy to fit (with one hand only) and read easily by the consumer (1). This would ensure the **under bed box** can be tested in situ to test its durability (1). This would ensure the **LED head touch** is easy to operate without having to look at the switch (1). This would ensure the **veneer packaging** is not too expensive for the user to purchase (1). *Credit any other appropriate response.*	AO4 2b [2]	**2**
(ii)			All of these products have been manufactured commercially, but in various quantities. Identify which scale of production is being described below: [1] Award 1 mark for each correct response: (I) Mass production; continuous production or repetitive flow. (II) Batch production. (III) One-off production; bespoke; job/jobbing production. *Credit any other appropriate response.*	AO4 2a [3]	**3**

Q	Science	Maths	Question or outline of question / Marking scheme	AO	Total
(d) (i)		1	The pictures and table below show collected anthropometric data from five students' hand measurements. [1] State which student has the shortest hand length. *Only acceptable answer hand length:* Student 3 (90mm) (1)	AO4 1a [1]	**1**
(ii)		2	Calculate the average hand *width* of all five students. [2] 1 mark awarded for correct selection of measurements and addition of total, and 1 mark for correct answer. 53mm + 45mm + 48mm + 44mm + 50mm = 240mm (1) 240mm / 5 = 48mm (1) *Credit any appropriate approach to calculating the average.*	AO4 1b [2]	**2**
(iii)		2	The average diameter of the index finger of the five students was found to be 16mm. Calculate the circumference of the index finger so a suitable length of silver wire can be used to make a circular ring*. (Show all workings)* [2] 3.14 x 16mm (1) = 50.24mm (1) (accept 50.3 or nearest). *Credit any appropriate approach to calculating circumference of the wrist.*	AO4 1b [2]	**2**
				Total	**20**

Q	Science	Maths	**Electronic systems and mechanical devices** Question or outline of question / Marking scheme	AO	Total
6. (a) (i)			The picture below is a Robotic Vacuum Cleaner. The robotic vacuum cleaner is commercially manufactured in batches. Name a suitable method of construction to make the main body casing. *Only acceptable answer for the most common method:* Injection Moulding	AO4 1a [1]	1
(ii)	✓		Outline **two** advantages of using the method of manufacture in (i) above Advantages of injection moulding. • Good product consistency. • Reduced requirements for finishing. • Good dimensional control • Fast production. • Low labor costs. • Leaves little post-production scrap. • Ability to include inserts. • Good colour control. • Design flexibility. • High-output production. • Multiple materials can be used at the same time. • Can be used to produce very small parts *Credit any other appropriate response.*	AO4 1b [1] AO4 2c [1]	2

Q	Science	Maths	**Electronic systems and mechanical devices** Question or outline of question / Marking scheme	AO	Total
(iii)			Name a suitable thermoplastic used to make the main body casing and give one reason why it is suitable. Suitable thermoplastics • Acrylonitrile-Butadiene-Styrene ABS • Polypropylene Any one reason listed below for ABS. • light weight • Relatively low cost materials • Good impact resistance • Forms into complex shapes • Good aesthetic qualities Any one reason listed below for Polypropylene • Semi-rigid • Good chemical resistance • Tough • Good fatigue resistance • Good heat resistance *Credit any other appropriate response.*	AO4 2b [2]	2

Q	Science	Maths	**Electronic systems and mechanical devices** Question or outline of question / Marking scheme	AO	Total
(iv)			At the end of every use, the robotic vacuum cleaner parks it's self in its charging dock. Complete the flow chart below to show control of its movements. Award one mark for each correct statement within the flow chart.  	AO4 2c [4]	4

<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>(b)

(i)
(ii)
(iii)

(iv)</td><td></td><td>5</td><td>The battery life of the robotic vacuum cleaner is equal to 175 revolutions of its wheel shown below. After 150 revolutions, the robotic cleaner returns to the docking station for a recharge. (Show all workings)

Calculate the diameter of the wheel. 40x2=80 (1)
Calculate the circumference of the wheel. πd(1), 3.14x80=251.2 (1)
Calculate how far the robotic cleaner will have travelled before it returns. 251.2x 150 revolutions =37,680mm (1)
Round off your answer in (iii) above to the nearest metre. 38m (1)</td><td>AO4 1b [3]
AO4 1c [2]</td><td>5</td></tr>
<tr><td>(c)</td><td></td><td></td><td>A new robotic vacuum cleaner comes with main component parts, accessories and packaging. Undertake a Lifecycle Analysis of this electronic product and its environmental impact on the environment. [5]

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 environmental impact of manufacturing on our plant. 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 environmental impact of manufacturing on our plant. 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 environmental impact of manufacturing on our plant. 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 2a [5]</td><td>5</td></tr>
</table>

Q	Science	Maths	**Electronic systems and mechanical devices** Question or outline of question / Marking scheme	AO	Total
			Indicative content This content is not prescriptive and candidates are not expected to refer to all the material identified below. The life-cycle analysis is one that looks at the environmental impact from a product beginning with the extraction of raw materials to the products' use and disposal. At each stage the energy used to transport (lorry, ship, aircraft) the part/product has a large environmental impact and should be referenced in the answer. Most electronic products are part and fully manufactured in developing countries and not the UK. There are a minimum of 5 key stages. The environmental impact of the lifecycle of a robotic vacuum cleaner: • Raw materials: metals galvanised, stainless steel, aluminium, brass and copper. Plastics: PVC, PP, ABS, HPDE, EVA and cardboard for packaging. • Production: metal stamping and plastic moulding to obtain shape. Energy and resources used in the production of the casing assembly, DC fan assembly, gear assembly, dust container, PCB, battery and power supply. Screen printing, product assembly, packaging and testing and storage produce waste. • Transport: raw materials and packaging to production factory, vacuum cleaner to retailer, and end-of-life waste to waste management facility. • Consumer use: Disposal of packaging, consumption of electricity and replacement of filters. • Disposal, recycle or reuse (plus transportation) – CO2/methane if landfill used in disposal, water and energy. *Credit any other appropriate response.*		

(d)			The robotic vacuum cleaner was manufactured in a factory that uses a batch production system. Evaluate the benefits of this method of production. [6] **Band descriptors and mark allocations**	AO3 2b [6]

	AO3 2b 6 marks	
BAND 3	A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate the benefits of mass production. 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 the benefits of mass production. 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 benefits of mass production. 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.

<u>Advantages of batch production:</u>

- It is cheaper to produce a whole batch instead of single, machines can be used more effectively.
- It is more accurate and consistent since machines replicate the exact same product leaving less faulty products.
- It has the flexibility to produce a variety of different product variations. This gives the customer a larger choice and hence a larger possibility of sales for the company.
- The company reduces its risk on simply concentrating on one product; it produces a variety of different ones of the same type.
- Materials can be bought in bulk which reduces cost
- It works well when small product runs are needed
- It is ideal for custom or seasonal, or trail runs of new products
- It reduces inventory. This can be critical when space is an issue.
- Allows workers to specialise and to use specialist machinery

Credit any other appropriate response.

Q6	Science	Maths	**Papers and Boards** Question or outline of question/Marking scheme	AO	Total
6. (a) (i)			The image below shows a set of disposable memory sticks. State the name of the process used to cut the shape of the memory sticks. [1] Die cutting or Laser cutting.	AO4 1a [1]	1
(ii)			(ii) The memory sticks are manufactured without the use of any glue. Give **two** advantages of manufacturing the memory sticks in this way. [2] Give one mark for each reason Appropriate answers could make reference to the following list: • Makes recycling easier • Makes manufacturing quicker • Makes manufacturing cheaper • Better for the environment Credit any other appropriate responses	AO4 1b [1] AO4 2C [1]	2
(iii)			Explain the Finishing process used to create the company logo on the front of the memory sticks. [2] Responses must include reference to Debossing Appropriate answer with appropriate detail: *Can be awarded 2 marks* E.g. Debossing is a finishing process that allows the manufacturer to sink parts of a design below the finished surface of a product. The manufacturer would push a die or mould into the surface of the product pushing it lower than the surface of the product, Candidates may make reference to the fact that colour could then be added to that section. Appropriate answer lacking detail: *Can be awarded 1 mark* E.g. Make dents in part of a design using a stamp that is pushed into the surface of the material.	AO4 2b [2]	2

Q6	Science	Maths	**Papers and Boards** Question or outline of question/Marking scheme	AO	Total
(a)(iv)			Using notes and sketches, describe how you would accurately manufacture multiple card prototypes of the memory sticks in a school setting. [4] Responses that demonstrate a clear understanding of the stages needed, and show clear understandable sketches with detailed notes can be awarded **4 marks. (Written communication should be present)** Responses that demonstrate some understanding of the stages needed, sketching is good but may be missing a stage with good notes can be awarded **3 marks. (Written communication should be present.** Responses that show the candidate has limited understanding of the stages needed, sketches are present but basic in parts with notes that lack detail can be awarded **2 marks. (Award a maximum of 2 marks if there is clear sketching but no written communication)** Responses that demonstrate little understanding of the stages needed but show sketches with very limited detail showing a lack of understanding, can be awarded **1 mark.** Responses should show how a candidate could use a jig or template. The stages below are suggestions and the candidate need not show all of the stages included, but demonstrate that they know how a jig is used and what order process are completed. 1 - Produce the Jig/template using CAM 2 - Prepare correct tools, cutting mat, Knife, safety rule. 3 - Place the Jig on top of the material. 4 - quality control checks, is the template in the correct place? 5 - Begin cutting around the jig. 6 - Final checks once cut.	AO4 2C [4]	4

Q6	Science	Maths	**Papers and Boards** Question or outline of question/Marking scheme	AO	Total
(b) (i) (ii) (iii)		5	When manufacturing the memory sticks, the electronic components cost £0.35 and the card costs £0.15 per unit. The assembly and manufacture of the memory sticks costs a further £1.08 per unit. Calculate how much it would cost the manufacturer to make 60,000 units of the memory stick. [1] The manufacturer sells the memory stick for £3.50. Calculate how much money the manufacturer would receive if they sold 80% of the 60,000 units. [2] Calculate the profit the manufacturer would make from the answer provided in (ii). [2] (i) Calculate cost of manufacture: £0.35 + £0.15 + £1.08 = £1.58 x 60,000 = £94,800(1) (ii) Calculate 80% of sales: 80% of 60,000 units = 48,000 (1) Company would receive: 48,000 x £3.50 = £168,000 (1) (iii) Profit: £1.58 x 48,000 = £75, 840 (1) £168,000 - £75,840 = £92,160 (1) Credit any appropriate approach to calculating the profit as a final price.	A04 1b[3] A04 1c{2}	5

<table>
<tr><th>Q6</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>(c)</td><td></td><td></td><td>Analyse why a growing number of products are using recycled boards and papers as an alternative to plastics and other materials. [5]

<table>
<tr><th colspan="3">AO3 2a 5 marks</th></tr>
<tr><td>BAND 3</td><td>Responses that demonstrate a clear understanding of the environmental need for more sustainable products to be used, in place of more traditional materials. 6R’s may be mentioned. Current environmental issuers could also be referenced, along with the fact that consumers are demanding more environmentally friendly products.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Responses that demonstrate some understanding of the issues surrounding the call for more sustainable materials, and how consumers are demonstrating the desire to be greener. Current issues may be referenced and candidates may make some mention of general sustainable issues, and consumer demand. Responses will not be as detailed as band 3.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Responses that demonstrate little understanding of the issues driving consumers desire to be more sustainable and how manufacturers have responded to this. Responses may be very limited in detail showing a lack of real understanding of the reasons behind a more sustainable ethos, but does reference one of the issues mentioned in band 2 or 3.</td><td>1</td></tr>
</table>

Responses make refer to the points below.

Candidate’s responses should refer to the fact that both consumers and manufactures are aware that more traditional materials, particularly plastics, are having a detrimental impact on the environment. Growing awareness amongst consumers has demanded that alternatives are found to deal with the impact of the waste modern society generates. Designers are now looking for more sustainable ways to design products, whilst manufactures promote the ethical approach of their companies to increase sales.</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

<table>
<tr><th>Q6</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>(d)</td><td></td><td></td><td>Different parts of the memory stick are manufactured in different parts of the world, and shipped to a central location where they are assembled and packaged.
Evaluate the benefits of manufacturing in this way. [6]

<table><tr><td colspan="3">AO3 2b 6 marks</td></tr><tr><td>BAND 3</td><td>Responses that demonstrate a clear understanding that local workforces and economies would benefit from the injection of investment. Wealth being spread globally, whilst the manufacturer can keep the cost of products lower by searching the globe for a cheaper workforce and cheaper manufacturing costs. Candidates may also reference that the consumer would have a wider cheaper choice as the market place would be more competitive.</td><td>5-6</td></tr><tr><td>BAND 2</td><td>Responses that demonstrate some understanding of the benefits of a more competitive market place. Candidates will look at the issues from more than one point of view and may mention the benefit to the global workforce or benefits to consumer but responses will not be as detailed as band 3.</td><td>2-4</td></tr><tr><td>BAND 1</td><td>Responses that demonstrate little understanding of the issues and may be very limited in detail showing a lack of real understanding of the reasons why manufactures decide to manufacture in this way, and who would benefit and why. Responses will reference one of the issues mentioned in band 2 or 3 but will lack detail.</td><td>1</td></tr></table>
Responses make refer to the points below.

The local workforce in various parts of the world will benefit from the employment. It allows the manufacturer to search for cheaper labour and cheaper parts, allowing them to either drive down the price of their product or make more profit. Regional governments will benefit from increased employment and the consumer could benefit from cheaper products. Manufacturing in this way would increase competitiveness in the market place.</td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

Q	Science	Maths	**Timbers and manufactured boards** Question or outline question / Marking scheme	AO	Total
6. (a) (i)			The picture is of a birch plywood stool. State the method of construction that would be used to manufacture the legs of the stool? [1] *Acceptable answers for manufacture of the legs of the stool:* laminating/steam bending and also cross halving joint.	AO4 1a [1]	1
(ii)	✓		Give **two** reasons why this is a suitable material for the manufacture of the stool. [2] 1 mark per reason, two required. *Acceptable answers based on:* o Birch is a hardwood that is strong and durable. (1) o Birch can be cut into strips and laminated to improve its strength. (1) o Birch can be steam bent into different shapes. (1) o Birch can be finished in different ways. ie) varnished, stained or painted.(1) *Credit any other suitable response.*	AO4 1b [1] AO4 2c [1]	2
(iii)			The manufacture of the stool relies on CNC *(computer numerical control)* machining. Outline **two** advantages of using CNC machinery to manufacture the stool. [2] *Responses could be based on:* o CNC machining is faster than cutting the birch legs and seat out by hand, so therefore takes less time. (1) o CNC machining ensures the accuracy of cutting out the birch every time. (1) o CNC machining requires less labour to manufacture the product, so therefore can be manufactured at a reduced cost. (1) o CNC machining can allow for pilot holes and screw holes to be predrilled to allow for easy assembly of the stool by the customer. (1)	AO4 2b [2]	2

Q	Science	Maths	**Timbers and manufactured boards** Question or outline question / Marking scheme	AO	Total
(iv)			The stool has a clear finish of polyurethane varnish added to it. Using notes and sketches describe the stages required to prepare the surfaces of the stool and apply the polyurethane varnish. [4] Award up to 4 marks for answers that demonstrates a clear understanding of the stages needed to add a finish of polyurethane varnish to the birch plywood stool safely. Award a maximum of 2 marks for clear sketching of stages even if written communication is missing. *Responses could be based on:* 1. Sand down the birch plywood surface in the direction of the grain using a variety of different grades of sand/glass paper. 2. Stir/shake the polyurethane varnish and apply evenly using a brush along the grain of the birch plywood. 3. Wait to dry and sand any rough texture down with wet and dry paper. 4. Repeat and reapply additional coats if required.	AO4 2c [4]	4

Q	Science	Maths	**Timbers and manufactured boards** Question or outline question / Marking scheme	AO	Total
(b)		5	The stool is manufactured in Sweden. The plywood cost £1.10, the assembly of the stool costs £3.05 and the cost of fittings was £0.20. (i) Calculate how much a batch order of 50,000 stools will cost the manufacturer to make. *(Show all workings.)* [1] Cost of 50,000 stools = cost of manufacture (3.05+1.10+ .20) x amount of stools 50,000 = £ **<u>217500. 00</u>** (ii) The manufacturer sells the stool for £9.00. Calculate how much money the manufacturer would receive if they sold 80% of the 50,000 stools. *(Show all workings.)* [2] Amount received if they sold 80% 80% of the batch of 50,000 = 50,000/100x80 = 40,000 stools. Cost of selling 40,000 stools. 40,000 stools x selling price £9 **= <u>£360,000.</u>** (iii) Calculate the profit the manufacturer would make from the answer provided in (ii). *(Show all workings.)* [2] Profit = Total Selling Price - Manufacturing Costs Profit = £360,000 –**<u>£217500 = £142500 Profit</u>**	AO4 1b [3] AO4 1c [2]	1 2 2

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Timbers and manufactured boards
Question or outline question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>(c)</td><td></td><td></td><td>Undertake a Life Cycle Analysis of the stool can and highlight its impact on the environment. [5]

Band descriptors and mark allocations

<table>
<tr><th></th><th>AO3 2a 5 marks</th><th></th></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse the environmental impact of manufacturing on our planet. 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 environmental impact on our planet. 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 environmental impact on our planet. There will be limited relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td>Award 0 marks for incorrect or irrelevant answers.</td><td>0</td></tr>
</table>
</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

Q	Science	Maths	**Timbers and manufactured boards** Question or outline question / Marking scheme	AO	Total
			Indicative content: This content is not prescriptive and the candidates are not expected to refer to all the material identified below. The life-cycle analysis is one that looks at the environmental impact from a product being launched with the growth/extraction of raw materials to the products' use and disposal. Trees are converted into planks or veneer that can then be used as a raw material for the stool. This uses up energy and cutting down trees affects the environment. Managed trees to sustain supply of materials to reduce environmental impact. The raw materials then need to be transported to the location of manufacture. Transport costs are high. At each stage the energy used to transport (by lorry, ship, aircraft) the materials has a large environmental impact and should be referenced in the answer. Manufacturing takes place in different locations and the raw materials & the stools are flat packed to save space and reduce costs of transportation. Built by the customer and easier to transport from shop to home. Packaged ready for distribution to sell in the shops. Location of manufacturing the stools may be close to the raw materials and some outlets but may have to be transported to different locations. The stools can be recycled to reduce environmental impact. Wood fibres made into MDF sheets required for future production of other products. Global manufacturers will manufacture the stools at various locations to save transportation costs. Disposal of the product at the end of its life. Consider the type of finish added? Is it harmful to the environment?		

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Timbers and manufactured boards
Question or outline question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>(d)</td><td></td><td></td><td>The stool was made in a factory that uses a batch production manufacturing system.

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

Band descriptors and mark allocations

<table>
<tr><th></th><th>AO3 2b 5 marks</th><th></th></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate the benefits of batch production There will be evidence of relevant examples and a well-developed substantiated judgments in a response that 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 the benefits of batch production. There will be some evidence of mostly relevant examples and partly substantiated judgments in a response that is generally structured.</td><td>3-4</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to evaluate the benefits of batch production. There will be limited evidence of relevant examples or judgments in a response that demonstrates little structure.</td><td>1-2</td></tr>
<tr><td></td><td>Award 0 marks for incorrect or irrelevant answers.</td><td>0</td></tr>
</table>
</td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

Q	Science	Maths	**Timbers and manufactured boards** Question or outline question / Marking scheme	AO	Total
			Indicative content: This content is not prescriptive and the candidates are not expected to refer to all the material identified below. **<u>Benefits of batch production:</u>** o Occurs when many similar products are produced together. o Each batch goes through one stage of the production process before moving onto the next stage. o The system is not fully automated like continuous flow and there are more workers on the production line. o It has lower capital costs than other forms of production. o It has the flexibility to produce different product variations or different products. o It works well when small production runs are required. o It can be tailored to the demand of the product. o The use of specialist machinery and workforce skills can increase production. o Larger workforce compared to other forms of production. o Time can be lost switching production runs to different products. o Tasks can be repetitive which can demotivate staff. o Company would need to store raw materials for production runs. o Profits can be re invested into production of different products. o Products can be manufactured in different production runs to cater for target market & demand. *Credit any other appropriate responses given.*		

Q	Science	Maths	**Ferrous and Non Ferrous Metals** Question or outline question / Marking scheme	AO	Total
6. (a) (i)			The picture below shows a fizzy drink can. The drinks cans are commercially produced and over two billion cans are manufactured annually. **Underline** the correct method of manufacture. [1] One of production Batch production Mass production. *Acceptable answers for manufacture of the cans:* Mass production. (1 mark)	AO4 1a [1]	1
(ii)	✓		The cans are manufactured from aluminium. Give two advantages why this is a suitable material to use. [2] 1 mark for each reason, two required. (2 marks) *Acceptable answers based on:* o Aluminium is light weight. o Aluminium is recyclable. o Aluminium does not rust. o Aluminium can be drawn into shapes and pinched. *Credit any other suitable response*	AO4 1b [1] AO4 2c [1]	2

Q	Science	Maths	**Ferrous and Non Ferrous Metals** Question or outline question / Marking scheme	AO	Total
(iii)			The manufacture of the can relies on automated production. Outline two advantages of using automated machinery to manufacture the drinks can. [2] Award 1 mark for any of the following (2 marks) : *Responses could be based on:* o Automated machinery is used as it speeds up production, so therefore takes less time. (1) o Automated machinery is used as it can handle very large quantities of the same product at one time in a continuous flow. (1) o Automated machinery is quicker than a human and can do repetitive jobs without error. (1) o Automated machinery ensures the accuracy of shaping the can and cutting out the top. (1) o Automated machinery requires less employees and therefore reduces the labour costs to manufacture the product, so therefore can be manufactured at a reduced cost. (1) o Automated machinery can also package products ready for transportation. (1)	AO4 2b [2]	2
(iv)			The design of the fizzy drink can is shaped differently at its top, compared to the bottom. Describe using notes and sketches how this helps the user stack the cans. [4] Award up to 4 marks for answers that demonstrates a clear understanding of the benefits of shapin the can. Award a maximum of 2 marks for clear sketching of stages even if written communication i missing. ***Responses could include any of the following:*** ***Up to 2 marks*** 5. The top is shaped so that it can be pressed and a hole is made in the top of the can for the rivet. (1) 6. The top of the can is shaped to accommodate the ring pull. (1) 7. The top of the can is shaped with a recess so that cans can be stacked and so that the ring pu is not damaged. (1) 8. The base of the can is a concave shape and allows for pressure of the drink and also allows t can to be stacked. This makes transportation easier. (1)	AO4 2c [4]	4

Q	Science	Maths	**Ferrous and Non Ferrous Metals** Question or outline question / Marking scheme	AO	Total
(b)		✓ 5	The fizzy drinks cans are manufactured at various locations across the world. The average cost of making one aluminium can is £0.02p each. (i) Calculate how much an order of 950,000 cans would cost the manufacturer to make. [1] (ii) The manufacturing company can save up to 25% of an order by using recycled cans. Calculate much they would they save on a repeat order that used recycled cans. [2] (iii) The actual selling cost of the fizzy drinks can is 50p. Calculate the profit the manufacturer would make if they used recycled cans on the order of 950,000. *(Show all workings).* [2] (i) Calculate cost of manufacture: £0.02 x 950,000 = **£19,000** (1) (ii) Calculate 25% of £19,000: 25% of £19,000 = **£4,750** (2) (iii) Profit: £19,000 - £4,750 = £14,250 £0.50 x 950,000 = £475,000 (1) £475,000 – 14,250 = **£460,750** (1) *Correct answer with workings out shown.*	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 question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>(c)</td><td></td><td></td><td>Undertake a Lifecycle Analysis of a fizzy drinks can explaining the impact it has on the environment. [5]

Band descriptors and mark allocations

<table>
<tr><th></th><th>AO3 2a 5 marks</th><th></th></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to analyse the environmental impact of manufacturing on our planet. 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 environmental impact on our planet. 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 environmental impact on our planet. There will be limited relevant examples or a logical chain of reasoning.</td><td>1</td></tr>
<tr><td></td><td>Award 0 marks for incorrect or irrelevant answers.</td><td>0</td></tr>
</table>
</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

Q	Science	Maths	**Ferrous and Non Ferrous Metals** Question or outline question / Marking scheme	AO	Total
			Indicative content: This content is not prescriptive and the candidates are not expected to refer to all the material identified below. The life-cycle analysis is one that looks at the environmental impact from a product being launched with the growth/extraction of raw materials to the products' use and disposal. Aluminium ore needs be mined and extracted from the ore which takes a lot of energy and transport costs are high. At each stage the energy used to transport (by lorry, ship, aircraft) the part has a large environmental impact and should be referenced in the answer. Manufacturing takes place in different locations an the raw materials & empty cans are then shipped to locations for further manufacture ie filling the cans and assembly of top to base. Packaged ready for distribution to sell in the shops. Location of manufacturing the cans may be close to the raw materials and some outlets but may have to be transported to different locations. Aluminium cans are recycled to reduce costs of raw materials in order to reduce costs and to sustain the raw materials required for future production. The cans and tops would be transported to drinks manufacturers ready for filling up with drinks as they are lighter to transport empty. Packs of drinks are packaged and then distributed to shops. Global manufacturers will manufacture drinks and fill the cans at various locations to save transportation costs.		

<table>
<tr><th>Q</th><th>Science</th><th>Maths</th><th>Ferrous and Non Ferrous Metals
Question or outline question / Marking scheme</th><th>AO</th><th>Total</th></tr>
<tr><td>(d)</td><td></td><td></td><td>The fizzy drinks can are made in a factory that uses a continuous flow production system.

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

Band descriptors and mark allocations
<table>
<tr><th></th><th>AO3 2a 5 marks</th><th></th></tr>
<tr><td>BAND 3</td><td>A coherent answer demonstrating detailed, relevant knowledge and understanding, to evaluate the benefits of continuous flow production There will be evidence of relevant examples and a well-developed substantiated judgments in a response that 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 the benefits of continuous flow production. There will be some evidence of mostly relevant examples and partly substantiated judgments in a response that is generally structured.</td><td>3-4</td></tr>
<tr><td>BAND 1</td><td>Answer demonstrates only basic knowledge and understanding, to evaluate the benefits of continuous flow production. There will be limited evidence of relevant examples or judgments in a response that demonstrates little structure.</td><td>1-2</td></tr>
<tr><td></td><td>Award 0 marks for incorrect or irrelevant answers.</td><td>0</td></tr>
</table></td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

Q	Science	Maths	**Ferrous and Non Ferrous Metals** Question or outline question / Marking scheme	AO	Total
			Indicative content: This content is not prescriptive and the candidates are not expected to refer to all the material identified below. **<u>Benefits of continuous flow production:</u>** o Production runs 24/7 and does not stop. o Identical products are made quickly. o Production is automated reducing labour costs. Workforce employed on shifts to man production line day and night. o High investment in machinery to set up production line. o A high number of products can roll off the assembly line. o Products can be manufactured in high volumes at a low cost and a high speed. o Benefits from economies of scale which lower the cost of production. o Materials can be purchased in bulk to reduce overall costs and improve profit margins. *Credit any other appropriate responses given.*		

Q6	Science	Maths	**Thermosetting and Thermoforming plastics** Question or outline of question/Marking scheme	AO	Total
6. (a) (i)			The image below shows a commercially used GPS drone. The drone is manufactured from a mix of polypropylene, epoxy resin and plastic laminates. State the name of the process used to construct the rotor blades of the drone. [1] Press or Compression moulding and injection moulding.	AO4 1a [1]	1
(ii)			Give **two** disadvantages of using polypropylene for the main body of the drone. [2] Give one mark for each reason Appropriate answers could make reference to the following list: • Can be difficult to manufacture at high temperatures. • Can be difficult to bond. • Is considered a tough plastic but can have poor impact resistance. • Suffers from UV degradation. • Can catch fire and has a low flammable temp Credit any other appropriate responses	AO4 1b [1] AO4 2C [1]	2
(iii)			Explain why the chassis of the drone uses plastic laminates in it's construction. [2] Responses must include reference to strength and rigidity Appropriate answer with appropriate detail: *Can be awarded 2 marks* E.g The chassis gives the drone it's strength and by laminating plastics you can build up the strength but crucially the rigidity of the material without adding any real weight. The material will then resist twisting and flexing, which is ideal for a drone. Appropriate answer lacking detail: *Can be awarded 1 mark* E.g. laminating plastics makes it stronger which will give the drone a stable base.	AO4 2b [2]	2

Q6	Science	Maths	**Thermosetting and Thermoforming plastics** Question or outline of question/Marking scheme	AO	Total
(iv)			Using notes and sketches, describe how you would accurately manufacture the domed main body of the drone in a school setting. [4] Responses that demonstrate a clear understanding of the stages needed, and show clear understandable sketches with detailed notes can be awarded **4 marks. (Written communication should be present).** Responses that demonstrate some understanding of the stages needed, sketching is good but may be missing a stage with good notes can be awarded **3 marks. (Written communication should be present).** Responses that show the candidate has limited understanding of the stages needed, sketches are present but basic in parts with notes that lack detail can be awarded **2 marks. (Award a maximum of 2 marks if there is clear sketching but no written communication)** Responses that demonstrate little understanding of the stages needed but show sketches with very limited detail showing a lack of understanding, can be awarded **1 mark.** Responses should show how a candidate could use a jig or template. 1- Turn the dome mould on a lathe 2- Check the angles of the mould to allow it to pop out of the finished dome. 3- Place the mould on the bed of the vac former. 4- Place the plastic above the mould and clamp into place. 5- Heat the plastic until its flexible. 6- Turn on the vacuum pump and suck the plastic around the mould. 7- Remove the plastic from the mould.	AO4 2C [4]	4

Q6	Science	Maths	**Thermosetting and Thermoforming plastics** Question or outline of question/Marking scheme	AO	Total
(b)			A small lightweight drone is to be developed and manufactured for recreational use. The electronic components for the drone cost £2.35 and the plastics cost £3.15 per unit. The assembly and manufacture of the drone costs a further £4.08 per unit. Calculate how much it would cost the manufacturer to make 12,000 drones. [1] The manufacturer sells a drone to a retailer for £58.00. Calculate how much the manufacturer would receive if they sold 80% of the 12,000 units. [2] Calculate how much profit the manufacturer would make from the answer provided in (ii). [2]	AO4 1b [1]	1
(i)			(i) Calculate cost of manufacture: £2.35 + £3.15 + £4.08 = £9.58 x 12,000 = **£114,960** (1)		
(ii)			(ii) Calculate 80% of sales: 80% of 12,000 units = 9,600 (1) Company would receive: 9,600 x £58.00 = **£556,800** (1)		
(iii)			(iii) Profit: £9.58 x 12,000 = £114,960 (1) £556,800 - £114,960 = **£441,840** (1) *Credit any appropriate approach to calculating the profit as a final price.*		

<table>
<tr><th>Q6</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>(c)</td><td></td><td></td><td>Analyse how consumers growing awareness of the impact of plastic waste is influencing manufactures use of the material. [5]

<table>
<tr><td colspan="3">AO3 2a 5 marks</td></tr>
<tr><td>BAND 3</td><td>Responses that demonstrate a clear understanding of the environmental need for more sustainable products to be used, in place of more traditional materials. 6R’s may be mentioned. Current environmental issuers could also be referenced, along with the fact that consumers are demanding more environmentally friendly products. Candidates may wish to focus on the fact that the issue has been in the media spotlight recently fueling the public’s growing awareness.</td><td>4-5</td></tr>
<tr><td>BAND 2</td><td>Responses that demonstrate some understanding of the issues surrounding the call for more sustainable materials, and how consumers are demonstrating the desire to be greener. Current issues may be referenced and candidates may make some mention of general sustainable issues, and consumer demand to be greener. Responses will not be as detailed as band 3.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Responses that demonstrate little understanding of the reasons detailed below, and may be very limited in detail showing a lack of real understanding of the reasons behind a more sustainable ethos, but does reference one of the issues mentioned in band 2 or 3.</td><td>1</td></tr>
</table>

Responses make refer to the points below.

Candidates’ responses should refer to the fact that both consumers and manufactures are aware that more traditional materials, particularly plastics, are having a detrimental impact on the environment. Growing awareness amongst consumers has demanded that alternatives are found to deal with the impact of the waste modern society generates. Designers are now looking for more sustainable ways to design products, whilst manufactures promote the ethical approach of their companies to increase sales.</td><td>AO3 2a [5]</td><td>5</td></tr>
</table>

<table>
<tr><th>Q6</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>(d)</td><td></td><td></td><td>Different parts of a product are now being manufactured in different parts of the world. The parts are shipped to a central location where they are assembled and packaged.

Evaluate the benefits of manufacturing in this way. [6]

<table>
<tr><td colspan="3">AO3 2a 6 marks</td></tr>
<tr><td>BAND 3</td><td>Responses that demonstrate a clear understanding that local workforces and economies would benefit from the injection of investment. Wealth being spread globally, whilst the manufacturer can keep the cost of products lower by searching the globe for a cheaper workforce and cheaper manufacturing costs. Candidates may also reference that the consumer would have a wider cheaper choice as the market place would be more competitive.</td><td>4-6</td></tr>
<tr><td>BAND 2</td><td>Responses that demonstrate some understanding of the benefits of a more competitive market place. Candidates will look at the issues from more than one point of view and may mention the benefit to the global workforce or benefits to consumer but responses will not be as detailed as band 3.</td><td>2-3</td></tr>
<tr><td>BAND 1</td><td>Responses that demonstrate little understanding of the issues and may be very limited in detail showing a lack of real understanding of the reasons why manufactures decide to manufacture in this way, and who would benefit and why. Responses will reference one of the issues mentioned in band 2 or 3 but will lack detail.</td><td>1</td></tr>
</table>

Responses make refer to the points below.

The local workforce in various parts of the world will benefit from the employment. It allows the manufacturer to search for cheaper labour and cheaper parts, allowing them to either drive down the price of their product or make more profit. Regional governments will benefit from increased employment and the consumer could benefit from cheaper products. Manufacturing in this way would increase competitiveness in the market place.</td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

Q	Science	Maths	**Fibres and textiles** Question or outline of question / Marking scheme	AO	Total
6. (a) (i)			The picture is of a child's printed t-shirt. The t-shirt is commercially manufactured in batches of 60,000. State what method of construction would be used to neaten the seams of the t-shirt. [1] *Only acceptable answer for seam neatening:* Overlocking/overlock stitch	AO4 1a [1]	1
(ii)	✓		T-shirts are made from knitted fabric. Give **two** reasons why a knitted construction is chosen for this type of child's clothing. [2] I mark per reason, two required. *Accept answers based on:* • Knitted fabric stretches which prevents creasing of (cotton) fabric (1). • Knitted fabric stretches to fit a range of body shapes/sizes (1). • Knitted fabric is more insulating than woven fabric (1). • Knitted fabric has a comfortable, next-to-skin quality (1). • Knitted fabric can be made on a circular knitting machine - cheaper method of manufacture (1). *Credit any other appropriate response.*	AO4 1b [1] AO4 2c [1]	2

Q	Science	Maths	**Fibres and textiles** Question or outline of question / Marking scheme	AO	Total
(iii)			Transfer printing relies on CAM (Computer Aided Manufacture), outline **two** advantages of using CAM when printing clothing. [2] Answers must include reference to printing for full marks. If there is no reference to printing in the answer a maximum of 1 mark can be awarded. 1 mark per advantage given, two are required. *Responses could be based on:* • CAM machine speed is faster than printing by hand, this ensures more printing can be achieved (in less time) (1). • CAM machine printing ensure accuracy of the print every time e.g. same colours/shade of colours (1). • Using CAM ensures consistency (and quality control) so every print is the same (1). • Using CAM means printing production can run 24 hours a day, 7 days a week if necessary (1) • Using CAM means there is no problem with using complicated patterns, designs, colours (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
(iv)			The dinosaur design has been inkjet transfer printed. Using notes and sketches describe the stages you would take to inkjet transfer print the decoration seen on to a t-shirt within a school setting. [4] Award up to 3 marks for answers that demonstrate a clear understanding of the stages needed to inkjet transfer print onto a t-shirt. Award a maximum of 2 marks for clear sketching of stages even if written communication is missing. *Responses could be based on:* 1. Print design onto transfer paper using an inkjet printer (1). 2. Cut around outside edge of design (1) 3. Remove/peel away backing paper (1). 4. Position face up onto t-shirt (1) 5. Cover transfer print using protective/parchment paper (1). 6. Using a hot iron (or heat press) transfer design onto the t-shirt (1). 7. Leave to cool before removing protective/parchment paper (1). **Note:** candidates may describe transfer printing using a 'light' transfer printing sheet. This requires reversing the image before printing and placing the transfer printed sheet, face down, on to the fabric. Heat is applied to transfer the design and the paper backing is peeled away. *This is NOT the correct process for this particular product design, however, marks should be awarded if all other processes are correctly described or drawn, so a maximum of 3 marks can be awarded.* *Credit any other appropriate response.*	AO4 2c [4]	4

Q	Science	Maths	**Fibres and textiles** Question or outline of question / Marking scheme	AO	Total
(b)		5	The t-shirt was manufactured in China and sold to a clothing company in the UK for £2.50. The cotton yarn to make the fabric cost £0.25, the manufacture of the t-shirt cost £1.08 and the cost of the transfer printing was £0.35.	AO4 1b [3] AO4 1c [2]	5
(i)			Calculate how much a batch order of 60,000 t-shirts will cost the manufacturer to make. [1]		
(ii)			If the manufacturer sold 80% of the t-shirts, calculate how much money they would receive. [2]		
(iii)			Calculate the profit that would be made on the sale of 60,000 units. [2]		
			(i) Calculate cost of manufacture: £0.25 + £1.08 + £0.35 = £1.68 x 60,000 = £100,800 (ii) Calculate 80% of sales: 60,000/100 x 80% = 48,000 sold t-shirts (1) Sales to clothing company: 48,000 x £2.50 = £120,000 (1) (iii) Profit: £120,000 - £100,800 (1) = £19,200 (1) *Credit any appropriate approach to calculating the profit as a final price.*		

<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>(c)</td><td></td><td></td><td>Billions of t-shirts are manufactured annually. Undertake a Lifecycle Analysis of a t-shirt and highlight its impact on the environment.

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 environmental impact of manufacturing on our plant. 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 environmental impact of manufacturing on our plant. 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 environmental impact of manufacturing on our plant. 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 2a [5]</td><td>5</td></tr>
</table>

Q	Science	Maths	**Fibres and textiles** Question or outline of question / Marking scheme	AO	Total
			Indicative content This content is not prescriptive and candidates are not expected to refer to all the material identified below. The life-cycle analysis is one that looks at the environmental impact from a product beginning with the growth/extraction of raw materials to the products' use and disposal. At each stage the energy used to transport (lorry, ship, aircraft) the part/product has a large environmental impact and should be referenced in the answer. Most clothing items are part and fully manufactured in developing countries and not the UK. There are a minimum of 6 key stages. The environmental impact of the lifecycle of a t-shirt: • Raw material growth/harvesting (plus transportation) – fertiliser, pesticides, use of combine harvester, water, energy • Material processing (plus transportation) – detergents, bleach, caustic NaOH (mercerisation of cotton), dyes, water, energy • Manufacture and assembly (plus transportation e.g. components) – cleansers (oil removal from machines), bleaching, dyes, printing inks, water, energy, waste • Packaging (plus transportation) – paper, plastics, printing inks, energy, waste • Product use (plus transportation) – bleach, detergents, water, energy • Disposal, recycle or reuse (plus transportation) – CO2/methane if landfill used in disposal, detergents, water and energy. *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>(d)</td><td></td><td></td><td>The t-shirt was made in a factory that uses the manufacturing system of cell production.

Evaluate how cell production benefits the workforce. [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 cell production benefits the workforce. 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 cell production benefits the workforce. 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 cell production benefits the workforce. 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></td><td>AO3 2b [6]</td><td>6</td></tr>
</table>

Q	Science	Maths	**Fibres and textiles** Question or outline of question / Marking scheme	AO	Total
			Indicative content This content is not prescriptive and candidates are not expected to refer to all the material identified below. <u>Advantages of cell production for workforce:</u> • Cell production allows workers to work together improving communication and any confusion which often occurs in large organisations. • Working in small teams means responsibilities are shared equally so everyone feels valued. • Cell production is less monotonous than assembly line. • Workers are multi-skilled, are paid more as a consequence, which in turn increases motivation/quality control. • As workers are multi-skilled they are more adaptable to future needs of business which ensures they feel valued. • Cell production teams are responsible for all stages of making, including quality control which gives them shared 'ownership'. • Workers need training to ensure they have a variety of skills to meet cell demands. <u>Disadvantages of cell production for workforce:</u> • Not all team members get on with each other which could cause delays and salary reductions if being paid piece rates. • Staff absence can cause delays, back logs and staff resentment as others in the team will need to pick up additional workload for those absent. • Workforce doesn't always feel valued as pressures to meet demand increases (the aim of cell production is to increase output) particular as there is an expectation due to increase in salary. • Backlogs can occur if other cells are not as efficient, this increases individual pressure and failure to meet targets set (bonus' may not be paid). *Credit any other appropriate response.*		
				Total	**25**