



GCE A LEVEL MARKING SCHEME

SUMMER 2023

**A LEVEL
DESIGN AND TECHNOLOGY - FASHION & TEXTILES
A601U10-1**

INTRODUCTION

This marking scheme was used by WJEC for the 2023 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.

Question 1

The dress pictured below is made from a weft-knitted rib fabric.

- (a) Explain why the designer chose a weft-knitted rib fabric to make the dress and why it would appeal to users.
- (b) Describe the main differences between warp and weft knitting and how the construction affects its end use.

Q 1	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
(a)	✓					2	2				4

Candidates should demonstrate knowledge and understanding of technical principles and awarded up to 4 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

- A knitted rib fabric has good stretch and recovery [1] allowing it to fit the contours of the body well [1] and is comfortable to wear [1]. Ribbing fabric is soft and lightweight making it easy to wear [1].
- Visually it is more appealing than a plain knit [1] as it adds texture to the fabric (and dress) [1]. The lines on the rib knit allow the dress to stand out more – makes more of a statement than a plain fabric [1].
- The garment shown is a summer dress, knitted fabrics such as the rib fabric, are highly permeable [1] allowing air to easily enter the garments, keeping the wearer cool in the summer heat [1].

Credit any other appropriate response.

(b)							2	2			4
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Candidates should demonstrate understanding of technical principles and apply it to specific appropriate points and awarded up to 4 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

- Warp knitting – multiple yarns that interlock along the length of the fabric [1] adjacent loops in the yarn interlace sideways along the length to create the knit [1]
- Weft knitting - from a single yarn that travels across the width of the fabric forming loops in the yarn [1] that interlock, with each successive row of loops being drawn from the row below [1]
- Weft knitting has more stretch and recovery than warp knitting which is more stable [1]
- Warp knitting does not unravel whereas weft knitting does [1], if holes are made in weft knitting 'runs and ladders' occur [1]
- Weft knitting drapes easily whereas warp knitting produces a firmer fabric [1]
- Weft knitting can be machine or hand knitted, whereas warp can only be made on a machine [1]
- Warp knitting is used to make lace, nets, edgings and trimmings, some clothing and sportswear, technical textiles [1]. Weft is used for single jersey type fabrics, and products such as T-shirts, tights, jumpers[1]

Credit any other appropriate descriptive response.

Question 2

The floor cushion shown below has a covered piped edging inserted into the seams.

- Using notes and sketches, explain how you would make a fabric-covered piped edging as shown above and insert it into a seam.
- Explain why a bias-cut woven fabric is essential when making the piped edging for the floor cushion.
- Calculate the total cost of the covered binding for a batch of 150 floor cushions, using the information listed below:
 - The radius of the floor cushion is 30 cm.
 - The cost of the piping cord is 35p per metre.
 - The cost of the bias-cut fabric is 40p per metre.

You must show all your workings.

Round your calculations to a whole number.

Q 2	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
(a)						2		2	2		6

Candidates should demonstrate understanding of technical principles and design and make principles and awarded up to 6 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

- Bias cut binding (fabric) needs to cover the cord and stitched in place to secure it [1]
- The piping insert should be laid on the right side and edge of the main piece of fabric [1] raw edges to the outside [1] and stitched to secure it in place, keeping the stitching line close to the cord [1]
- The second piece of fabric (the other side) is laid on top, right sides facing, raw edges together [1] and stitched through all pieces to secure [1]



Assess the work as a whole and credit both diagrams and notes to explain the concept. Apply a best fit when awarding marks.

Credit other appropriate responses.

(b)	✓						2				2
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Candidates should demonstrate knowledge and understanding and awarded up to 2 marks based on:

No response or an inappropriate response – 0 marks

Responses should be based on:

- Woven fabric has some stretch across the bias line [1] which is the diagonal line and at a 45° angle to the selvedge edge [1]
- As a bias cut strip has some stretch it wraps over the cord easily and smoothly [1] it will not have any tucks in the fabric covering the cord which would detract from the desired effect [1]

Credit any other appropriate response.

Q 2	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
(c)		7						7			7

Candidates should demonstrate knowledge and understanding and apply it to technical principles and awarded up to 7 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

- Circumference of the circular cushion use of correct formula: $2\pi r$
- Numeric values $2 \times 3.142 \times 30 = 189\text{cm}$ [1]
- Quantity of piping cord per cushion (2 sides) : $189 \times 2 = 378\text{cm}$ or 3.78m [1]
- Same figure for bias binding per cushion = $189 \times 2 = 378\text{cm}$ or 3.78m .
- Quantity of piping cord for 150 cushions: $3.78 \times 150 = 567\text{m}$. [1]
- Same figure for bias binding per 150 cushions $3.78 \times 150 = 567\text{m}$
- Recognition that component costs are per metre not centimetres [1]
- Piping cord for 150 cushions: $567\text{m} \times 0.35 = £198.45$. [1]
- Bias binding for 150 cushions: $567\text{m} \times 0.40 = £226.80$. [1]
- Total cost of both components for 150 cushions: $£425.25$. [1]

NOTE: Candidates might round up the quantity of piping cord and bias binding to a whole number ie 4m as these components are usually only available in metre or half metre lengths. Accept answers based on this number.

In this case total cost for both components for 150 cushions: £450

Accept other methods of calculation.

All calculations need to be shown for full marks.

Question 3

Fabrics made from cellulosic fibres such as cotton, linen and viscose are prone to creasing.

- (a) Explain the benefits of a crease-resistant finish on cellulosic fabrics and how the finish is applied.
- (b) Polyester and linen fibres and yarns are often blended and mixed together. Explain why this fibre blend or mix improves the functionality of the resultant fabric.

Q 3	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
(a)	✓					4			1		5

Candidates should demonstrate knowledge of technical principles and awarded up to 5 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

Crease resistant finish:

- Cellulosic fabrics are passed through a liquid containing synthetic resins[1] which enter the fibres in small molecules [1]. The fabric is held flat and smooth [1] while heated to cure the resin [1]. The resin molecules join with the fibre molecules [1] and are then held in a permanent state [1]
- A crease resistant finish will prevent the cellulosic fabric from creasing [1] meaning it will look better in use for longer [1].
- This finish also reduces the need for ironing [1] as it does not crease during a wash cycle for example [1] or need re-ironing after use [1]. It makes fabrics treated with this finish easier to care for [1].

Credit other appropriate responses.

(b)	✓								3		3
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Candidates should demonstrate knowledge of design and make principles and awarded up to 3 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

- Linen is naturally absorbent [1] and will keep the wearer cool in hot conditions [1] because it soaks up moisture (from perspiration) [1] although it does take longer to dry when fully wet (eg. in the wash) [1]
- Polyester is non absorbent [1] and will therefore dry quickly ie after a wash cycle [1]
- Linen creases easily as it is non-elastic [1] but polyester does not as it has good elasticity [1] meaning the resultant fabric will crease far less than linen alone [1]
- Polyester is resistant to mould if it remains damp for long periods [1], linen is prone to damage from mould [1]
- Linen is non-static as it retains some moisture whereas polyester does not contain any moisture and is therefore prone to static [1] the blend reduces static [1]
- The resultant fabric is much easier to care for as it combines the best properties of both fibres[1] leading to a superior fabric with better properties [1]

Credit other appropriate responses.

Question 4

Textile fibres, used to make yarns and fabrics, can be natural, synthetic or regenerated. The impact each fibre will have on the environment will depend on its market share. This is based on the number of products made from each fibre and is measured in metric tonnes.

- (a) Study the chart below which shows world fibre production in metric tonnes. Calculate the percentage (%) that synthetic fibres account for in world fibre production.
Show all your workings.
- (b) The total cotton fibre production is 32 000 000 metric tonnes.
 - (i) Organically grown cotton is included in this figure but only makes up for 3.5% of the total for all cotton fibre grown. Calculate the quantity in metric tonnes that organic cotton accounts for.
Show all your workings.
 - (ii) Calculate the percentage (%) of the world total fibre production that organic cotton accounts for.
Show all your workings
- (c) Explain what a regenerated fibre is and why they are considered viable alternatives to cotton for use in clothing.

Q 4	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
(a)		4				2	2				4

Candidates should demonstrate knowledge and understanding of technical principles and and its application in this context to be awarded up to 4 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

- Total of world fibre production:
 $55,000,000 + 2,500,000 + 3,500,000 + 32,000,000 + 9,000,000 + 4,500,000 + 7,500,000 + 4,500,000 = 118,500,000$ metric tonnes. [1]
- Synthetic total: $55,000,000 + 9,000,000 + 7,500,000 = 71,500,000$ [1]
 (polyester, polyamide, acrylic)
- $\frac{\text{Total for synthetics}}{\text{World total}} \times \frac{100}{1}$
- $\frac{71,500,000}{118,500,000} \times \frac{100}{1}$ [1]
- Answer: 60% [1]

Accept other methods of calculation.

All calculations need to be shown for full marks.

Q 4	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
(b) (i)		2						2			2
Candidates should demonstrate knowledge and understanding of technical principles and its application in this context to be awarded up to 2 marks. No response or an inappropriate response – 0 marks Responses should be based on: - Total cotton in tonnes x 3.5% 32,000,000 x 0.035 [1] - Answer: 1,120,000 metric tonnes [1] <i>Accept other methods of calculation.</i> <i>All calculations need to be shown for full marks.</i>											
(ii)		2						2			2
Candidates should demonstrate knowledge and understanding of technical principles and its application in this context to be awarded up to 2 marks. No response or an inappropriate response – 0 marks Responses should be based on: $\frac{\text{Organic cotton in metric tonnes}}{\text{World fibre production.}} \times \frac{100}{1}$ $\frac{1,120,000}{118,500,000} \times \frac{100}{1}$ [1] - Answer: 0.95% (Less than 1%) [1] <i>Accept other methods of calculation.</i> <i>All calculations need to be shown for full marks.</i>											

Q 4	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
(c)	✓							4			4
Candidates should demonstrate knowledge and understanding of technical principles to be awarded up to 4 marks. No response or an inappropriate response – 0 marks Responses should be based on: - Regenerated fibres are extracted from (for example) wood pulp [1] or cotton linters [1] which means they are from a natural source similar to cotton - cellulosic [1] therefore they will have similar properties to cotton [1]. Regenerated fibre is created by dissolving the cellulose from, for example wood pulp in a soluble mix of chemicals and then remaking it into a fibre again [1]. Regenerated fibres are therefore part natural and part synthetic [1]. - Like cotton, regenerated fibres are absorbent [1] and will be cool to wear [1]. - They are easy to care for and wash similar to cotton [1]. - Like cotton regenerated fibres are comfortable next to the skin [1] and have good draping qualities [1] and handle well [1]. All these properties make regenerated fibres equal to cotton [1] - From an environmental perspective they are also biodegradable as is cotton [1]. - Regenerated fibres can also be blended or mixed with other fibres [1]. <i>Accept references to extrusion and precipitation methods in reference to the process of regenerating fibres</i> <i>Credit any other appropriate response.</i>											

Question 5

The fashion leggings we recognise and wear today originated in the 1960's when Dupont created the very first Lycra leggings. Many iterations have followed with designers continuing to rework them into current trends.

- (a) Explain how lifestyle choices in recent years have impacted on the continued popularity of leggings.
- (b) Using notes and sketches, explain how Lycra can be incorporated into yarn and how it has impacted on fabrics used for sportswear.

Q 5	Science	Maths		AO3		AO4				Total
				2a	2b	1a	1b	1c		
(a)						2	3			5

Candidates should demonstrate knowledge and understanding of technical principles and awarded up to 5 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

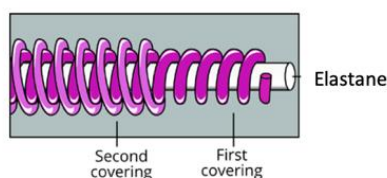
- More opportunities exist for different leisure activities meaning this versatile product can be worn for a number of different activities/occasions [1]
- Leggings worn as part of an outfit can be dressed up or kept casual meaning the product is versatile [1]. The more ways a product can be worn means value for money for consumers [1]. Good investment in terms of clothing choice [1]
- Leggings are comfortable and easy to wear as they stretch to fit most shapes [1]; comfort is a major consideration for consumers when buying clothing [1]
- Sporty looks for casual day wear are popular and leggings fit this descriptor well [1]
- Although the basic shape remains constant leggings can be styled very casually or smarter depending on choice of fabric/design [1]
- Men can also wear leggings as part of their sportswear – underarmour/base layers [1]
- Leggings are also included in thermal underwear collections [1] as outdoor pursuits are popular for many [1]

Credit other appropriate responses.

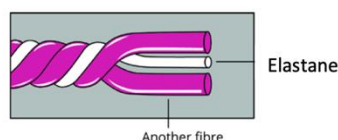
Q 5	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c			
(b)	✓						5				5

Candidates should demonstrate knowledge and understanding of technical principles and awarded up to 5 marks.

No response or an inappropriate response – 0 marks



Sketch 1: The core of the yarn is lycra and has other fibres wrapping over it to conceal it.



Sketch 2: The Lycra fibre is twisted in with other fibres, not entirely concealed.

A basic sketch, some annotation, shows some understanding. [1]

A more detailed sketch, good annotation showing clear understanding. [2]

Award up to 3 marks should be awarded for the impact Lycra has had on fabrics used in sportswear

Responses should be based on:

- Lycra's main property is its ability to stretch and recover [1]
- When included in clothing it retains its properties meaning clothing can also stretch and recover as required [1]
- Clothing maintains its shape even when stretched [1]
- Clothing can stretch to fit any shape – comfortable [1]
- The lycra will keep clothing in place – less likely to move around despite activity [1]
- Less irritation from clothing as it fits snugly to the body [1]
- It allows for a streamlined shape – less restriction from clothing [1]

Credit other appropriate responses.

Question 6

The pictures below show a fleece liner packaging product made from 100% felted wool fibre. It is used as an alternative to plastic packaging for the transportation of temperature-sensitive goods.

Explain how the properties of wool make it suitable for use in either the transportation of temperature-sensitive food products or pharmaceuticals.

Q 6	Science	Maths		AO3		AO4				Total	
								2a	2b		2c
	✓								5		5

Candidates should demonstrate understanding of design and make principles and awarded up to 5 marks.

No response or an inappropriate response – 0 marks

Responses should be based on:

- The natural crimp in wool fibre means it is highly effective in trapping air and retaining heat – effective natural insulator [1]
- Wool can absorb smells and harmful chemicals[1]
- Wool can absorb up to 40% of its own weight in moisture without feeling wet (hygroscopic) – [1] products are therefore protected from any condensation damage in a packaging box [1] wool has the natural ability to remove moisture from the air [1]
- In terms of insulative performance 100% wool (from sheep) out performs man made equivalents such as polystyrene[1]
- Temperature sensitive products such as foodstuffs and pharmaceuticals can be kept cooler for longer in transit [1]
- Temperature sensitive food products – home delivery options – can be kept warmer for longer – does not cool down [1]
- When refrigeration is not available to help keep a delivery cool – such as a vaccine delivery into a rural area or difficult terrain[1] – insulated packaging for pharmaceuticals using wool provides both the protective and insulative answer to this problem [1]
- Wool is a smart, complex and a very technical fibre, and provides superior high performance in insulated packaging materials – critical in the transportation of pharmaceuticals [1]
- Wool has natural thermo-regulating qualities – maintains a constant temperature whether that is cool or warm [1]
- Whilst paper or cardboard can be used in packaging, significantly more is needed in comparison to the quantity of wool in order to achieve similar performance [1]
- Paper and cardboard (not natural insulators) would need icepacks to keep temperatures low whereas wool does not [1]
- The flexibility of the felted wool packaging can wrap around contents eliminating unnecessary air pockets – reduces volume of packaging also thermally more efficient [1]

Credit any other appropriate response.

Question 7

Different types of specifications are used in the design and manufacture of fashion and textile products.

- (a) Outline the most critical fabric details that would be listed on a fabric specification for a high-performance mountaineer jacket and evaluate their importance to the end user.
- (b) Analyse the importance of including measurable criteria in the design specification for the business backpack shown below.

Q 7	Science	Maths		AO3		AO4				Total	
				2a	2b	1b	1c	2a	2b		2c
(a)					4					2	6

Candidates should show knowledge and understanding, clear evidence of appraisal and/or making judgements and **apply** this to technical principles to be awarded up to 6 marks.

Responses should be based on:

- The fabric specification should outline the details of a fabric that will perform at the highest level that a mountaineer would expect from the jacket
- The chosen fabric would have been tested to ensure the end product will perform as intended – details are included in a fabric specification
- For high tech clothing such as this type of jacket the fabric properties are critical

Fabric specification content could refer to:

- Gram weight; applied finishes; laminated: construction type; width; thickness; density; fibre source; test results

Performance characteristics needed for high performance clothing ie. jacket

- Waterproof (finish) – to ensure user remains dry at all times;
- Windproof - close weave would ensure this, keeps user warm
- Breathable (laminated eg. Gore tex) – allows moisture out to retain constant body temperature, mountaineer does not over heat or get too cold
- Lightweight (gram weight) – ensures activity is not restricted
- Durability (thickness and fibre source) – needs to withstand wear and tear from strenuous activity and use
- Insulative (thickness/weave) – keep user comfortable

Two to three performance characteristics fully evaluated are required for full marks

Credit any other appropriate response.

Band	Marks	AO3 2b	Marks	AO4 2c
2	3–4	Good evaluation of fabric performance properties and their importance to the end user of high performance clothing. A thorough discussion, which appraises and/or makes judgements in the context of this question. Generally well considered, relevant wider issues used as a context for the discussion.	2	Applies a sound knowledge and understanding of technical principles relating to a fabric specification in the context of this question.
		There is a line of reasoning which is generally coherent, mainly relevant and with some evidence and structure.		
1	1–2	Limited evaluation of fabric performance properties and their importance to the end user of high performance clothing. Little evidence of appraising or making judgements in the context of this question. Few issues are identified.	1	Applies a basic knowledge and understanding of technical principles relating to a fabric specification in the context of this question.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark.		

Q 7	Science	Maths		AO3		AO4			Total	
				2a	2b	1b	1c	2a		2b
(b)				4			2			6

Candidates should provide evidence of either deconstructing information, find connections and/or logical chains of reasoning and **apply** it appropriately to design and make principles to be awarded up to 6 marks.

Responses should be based on:

- Measurable criteria could refer to: overall dimensions; sizes of parts; weight; ability to withstand stresses; cost; anthropometric and ergonomic factors; durability
- The inclusion of measurable criteria is critical as it is a means of measuring the success of the final outcome
- Testing the final outcome against set measurable criteria– will it perform as intended?

Discussion might refer to the following:

- Overall size being comfortable to carry as a back pack/in hand loaded and empty
- Adjustable straps allow for user height variations – ergonomics/anthropometrics
- Weight of the empty back pack being appropriate so that it is still comfortable when fully loaded
- Inner pockets need to be able to store intended items (pictured) efficiently and safely – maximum use of space – size is critical
- Cost of chosen materials should not affect the products RRP (retail price)
- Retail cost needs to be affordable for end user – user reviews
- Stress tests on the fabric, components parts and construction would enable the designer to assess ability to withstand wear and tear

Credit any other appropriate response.

Band	Marks	AO3 2a	Marks	AO4 1c
2	3–4	Good analysis of the importance of including measurable criteria in the design specification in the context of this question. A generally sound discussion, which deconstructs information and demonstrates logical reasoning throughout. Generally well-considered, relevant issues used as a context for the discussion.	2	Applies a sound knowledge and understanding of design and make principles in the context of this question.
		There is a line of reasoning which is generally coherent, mainly relevant and with some evidence and structure.		
1	1–2	Limited analysis of the importance of including measurable criteria in the design specification in the context of this question. Little evidence of logical reasoning. General discussion is limited.	1	Applies a basic knowledge and understanding of design and make principles in the context of this question.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark.		

Question 8

3D printing is increasingly used in the fashion and textile industry in the development and manufacture of products.

Evaluate the use of 3D printing as an innovative method of developing and manufacturing fashion and textile products.

Q 8	Science	Maths		AO3		AO4			Total		
				2a	2b	1b	1c	2a		2b	2c
					6					3	9

Candidates should show knowledge and understanding of wider issues, with clear evidence of appraisal and/or making judgements and apply this to designing and making principles to be awarded up to 9 marks.

Responses should be based on:

- 3D printing has created new avenues for customisation, sustainability and creativity
- Products from accessories to full looks are possible
- It might take hours to create a piece but it results in less waste and proves far less labour-intensive than other types of manufacturing
- Environmental focus – printing garments on-demand reduces fabric waste by about 35%
- This minimal waste approach could provide valuable insights on how to reshape the current state of factories and align them with a more sustainable, social and ethical approach
- 3D printing allows products to be manufactured in one piece
- Drawn on the computer then printed layer by layer – additive manufacture
- Difficult to achieve some designs through traditional techniques and construction processes
- Designs can be radically different and more complex in shape
- Iterations can be tested quickly after printing allowing for many more iterations to follow - incremental improvements - quickly
- Allows for more sculptural shapes to be created
- Some shapes are only achievable through 3D printing
- Depending on machine, product size might be an issue
- If whole garments are to be 3D printed, component pieces still have to be joined together/assembled
- 3D printing can manufacture component parts within hours, which speeds up the prototyping process – efficient
- 3D printing can be used to create items in a selection of plastics and metals but the list is not exhaustive - not all metals or plastics can be temperature controlled enough to allow 3D printing
- Iris Van Herpen is a pioneer of 3D printing – her most notable piece is the "Crystallization" top, 3D printed from white polyamide
- Recycled materials can be used in 3D printing – Iris van Herpen created a haute couture dress constructed from ocean plastic fabric produced by Parley for the Oceans. The material is made from upcycled marine waste, sourced from the estimated eight million tons of plastic waste that end up in our oceans every year. Parley for the Oceans collects plastic debris from shores and oceans, which is shredded and reworked into yarn – environmental benefit
- 3D printing also takes fashion to a new level of conceptual art - Anouk Wipprecht's incredible Spider Dress, which has mechanical arms which shift depending on the closeness of other people. This 3D printed dress combines the cutting-edge scientific technology with haute couture fashion, demonstrating the versatility of this new technology
- Digital knitting is also developing in the 3D printing world, and allows for many customization possibilities. Manufacturers like Shima Seiki can turn cones of yarn into a full, seamless garment in less than an hour

Accept other appropriate responses.

Band	Marks	AO3 2b	Marks	AO4 2c
3	5–6	Excellent evaluation of the wider issues relating to 3D printing. A thorough discussion, which appraises and/or makes judgements about 3D printing as an innovative method of developing fashion and textile products. Well considered, relevant wider issues used as a context for the discussion.	3	Applies a thorough knowledge and understanding of design and make principles in the context of 3D printing.
		There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.		
2	3–4	Good evaluation of the wider issues relating to 3D printing. A thorough discussion, which appraises and/or makes judgements about 3D printing as an innovative method of developing fashion and textile products. Generally well considered, relevant wider issues used as a context for the discussion.	2	Applies a generally sound knowledge and understanding of design and make principles in the context of 3D printing.
		There is a line of reasoning which is generally coherent, mainly relevant and with some evidence and structure.		
1	1–2	Limited evaluation of the wider issues relating to 3D printing. Little evidence of appraising or making judgements about 3D printing as an innovative method of developing products. Few issues are identified.	1	Applies a basic knowledge and understanding of design and make principles in the context of 3D printing.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark		

Question 9

The 4Ps of marketing is a strategy an organisation might use to bring new fashion and textile products to market.

With reference to the 4Ps, discuss how the digital world is changing the way fashion and textile products are being brought to market when compared to traditional strategies.

Q 9	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2b	2c	
								5		4	9

Candidates should demonstrate knowledge, and apply knowledge and understanding to technical principles, and application of design and make principles to be awarded up to 9 marks.

Discussion should be based on the following points:

The 4Ps of marketing:

Product:

- What do users want from the product/ who does it need to satisfy? Essential features needed; where it will be used; appearance; user experience; name of product; branding; new or redesigned product

Place:

- Where will users look for the product; store – what kind? online, direct, catalogue; distribution channels; sales force needed; trade fairs; online submissions; samples to catalogue companies; what do competitors do?

Price:

- Value of product to users; established price points; users could be price sensitive; expected market share – dependant on price; possible discounts; price comparison to competitors

Promotion:

- Getting the company message across to target customers - by advertising online, in the press, on TV, on radio, or on billboards; by using direct marketing mailshots; through PR; on the internet; timing of promotion - seasonality in the market; wider environmental issues might suggest or dictate the timing of the market launch or subsequent promotions; the way competitors do promotions

Digital marketing:

- The 4ps provide a strong foundation for digital marketing too - super-connectivity, online consumerism and multiple devices
- Users now go to the internet to search for new items, can look for things globally instead of relying on local businesses – choice has widened/ is far greater
- Businesses not only need to get noticed but also provide users with consistent invaluable information to convince them of their products worth
- Online consumers visit many websites to find the best deal, there is a massive stock of information at their disposal
- Online consumers leave behind their digital footprints in the shape of cookies, downloads, and click-throughs. Organisations can use all this information to devise a detailed buyer profile and can identify an ideal target market - what they need, how they would achieve it, the incentives they would be responding to, and how all of it influences the product plan
- Online platforms need to provide a positive user experience from initial website visit to after sales care – maintain customer loyalty

- Data provided via the internet means companies can detect the future of the market, the mode of communication and how each can be used effectively; social media interaction; type of devices used; use of algorithms to look for relevance; importance of being visible in the online market
- Sharing the right type of message across platforms - how your product is viewed; content has to look good and be persuasive across multiple devices
- Content in online marketing needs to be tailored - web pages, blogs, social media and email to encourage the engagement with the right people at the appropriate time
- Fashion collections/ catwalk collections through VR (virtual reality) – 3D imaging; use of avatars to launch collections
- Global interaction to develop and launch products

Credit any other appropriate response.

Band	Marks	AO4 1b and 1c	Marks	AO4 2b and 2c
3	4–5	Demonstrates and applies a thorough knowledge and understanding of technical principles in the context of the 4Ps of marketing and the digital world. Well considered, relevant wider issues identified.	3–4	Demonstrates and applies a thorough knowledge and understanding of design and make principles in the context of the 4Ps of marketing and the digital world drawing on well-considered, relevant examples.
		There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.		
2	2–3	Demonstrates and applies good knowledge and understanding of technical principles in the context of the 4Ps of marketing and the digital world. Generally well-considered, relevant issues identified.	2	Demonstrates and applies a generally sound knowledge and understanding of design and make principles in the context of the 4Ps of marketing and the digital world. Generally well-considered examples are provided.
		There is a line of reasoning which is generally coherent, mainly relevant and with some evidence and structure.		
1	1	Demonstrates and applies a basic knowledge and understanding of technical principles in the context of the 4Ps of marketing and the digital world. Some relevant issues identified and used to support the discussion.	1	Demonstrates and applies a basic knowledge and understanding of design and make principles in the context of the 4Ps of marketing and the digital world. Few examples are provided.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark.		

Question 10

Fashion and textile products go through a series of stages during their life cycle. Analyse the environmental impact of a polyester cotton shirt at each stage of its life cycle 'from cradle to grave'.

Q 10	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2b	2c	
	✓			6				6			12

Candidates should provide evidence of either deconstructing information, find connections and/or logical chains of reasoning and **apply** it appropriately to technical principles to be awarded up to 12 marks.

Responses should be based on the following points:

Source/raw material extraction:

- Cotton: plant based; sustainable; biodegradable; vast amounts of water necessary for growth; grown where water is often a scarce commodity; water is often diverted away from areas of need ie villages, other farmland: where water has been diverted and riverbeds are dry, soil erosion occurs; pesticides and insecticides used to increase yield; these chemicals can seep into the soil causing contamination; ecosystems also affected by chemical use
- Polyester: not sustainable; by-product from the oil industry; not biodegradable; basically it is a plastic derived from crude oil; contamination issues around the oil industry, potential damage to eco-systems

Manufacture and processing:

- Polyester requires more than double the energy of conventional cotton to produce
- The water-intensity of polyester production is much lower than for natural fibres
- The production of polyester uses harmful chemicals (including carcinogens), and if emitted to water and air untreated, can cause significant environmental damage
- Some countries where polyester is produced have lax rules when it comes to environmental concerns; in these countries air and water pollution is often discharged untreated, resulting in significant pollution and harm to communities in the vicinity of manufacturing plants
- Polyester cannot be dyed using low impact and natural dyes. This means that the detrimental impact on water supplies is potentially far greater
- Cotton: it takes about 2,700 litres of water to make a cotton T-shirt, any processing of cotton for the shirt will be on a similar scale
- Cotton production is responsible for the emission of 220 million tons of CO₂ annually
- Cotton is usually bleached, pre-shrunk, dyed, printed before being ready for further use – all process use water and chemicals which may or may not be disposed of in an environmentally friendly manner – similar issues to polyester in factories
- Energy, possible use of renewables, used throughout processing of both fibres into yarns, cloth and products adds to the products carbon footprint

Transportation:

- Carbon footprint is added to when fibres/yarns/ fabrics are transported several times at various stages until the product is finally available for sale
- The process of making a polyester cotton shirt involves multiple agencies which could be in several different locations across the globe – carbon footprint
- Depending on mode of transport this could vary – air, sea, road – petrol or green energy

Usage:

- A polyester cotton shirt is easily washed and will withstand a lot of wear therefore several washes, there will be an environmental impact each time it is washed – detergents and their safe disposal; the care cycle and energy consumption for this is an environmental consideration
- Thousands of microscopic fibres can be released from synthetic fibres/fabrics (ie. plastic) into the water during each wash cycle, once in the waterways these plastic fibres can poison or starve aquatic animals that accidentally ingest them
- Energy efficient washing machines can reduce the impact.

Disposal:

- Cotton is biodegradable; polyester is not biodegradable and will persist in the eco-system even as it eventually breaks apart.
- The product could be recycled/ upcycled into a different product extending its useful life
- Millions of tons' of cotton-polyester blend material is currently dumped in landfills, fibre blends are problematic in terms of disposal because they cannot be recycled easily/profitably; polyester and cotton individually are easily recycled
- Emerging technology means that polyester/cotton blends could be recycled thanks to a patented process capable of removing dyes from textiles while separating cotton from fabric blends and depolymerising polyesters – circular economy
- Contamination issues with landfill

To be awarded marks in the top band, at least four stages of a products life cycle must be referenced.

Accept other examples where candidates put forward links and explains the relevance

Band	Marks	AO3 2a	Marks	AO4 1c
3	5–6	Excellent analysis of the wider issues relating to the environmental impact of the shirt during its lifecycle. A thorough discussion which deconstructs information and demonstrates logical reasoning throughout. Well-considered, relevant wider issues used as a context for the discussion.	5–6	Applies a thorough knowledge and understanding of technical principles to the context of the environmental impact of the shirt during its lifecycle.
		There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.		
2	3–4	Good analysis of the wider issues relating to the environmental impact of the shirt during its lifecycle. A generally sound discussion, which deconstructs information and demonstrates logical reasoning throughout. Generally well-considered, relevant issues used as a context for the discussion.	3–4	Applies a generally sound knowledge and understanding of technical principles to the context of the environmental impact of the shirt during its lifecycle.
		There is a line of reasoning which is generally coherent, mainly relevant and with some evidence and structure.		
1	1–2	Limited analysis of the environmental impact of the shirt during its lifecycle. Little evidence of logical reasoning. General discussion is limited.	1–2	Applies a basic knowledge and understanding of technical principles in the context of the environmental impact of the shirt during its lifecycle.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark		