



GCE A LEVEL MARKING SCHEME

SUMMER 2019

**A LEVEL (NEW)
DESIGN AND TECHNOLOGY - UNIT 3
PRODUCT DESIGN
1603U30-1**

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.

**GCE A LEVEL (NEW)
DESIGN AND TECHNOLOGY**

UNIT 3 - 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 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.

In Design and Technology, each question addresses one assessment objective: either AO3 or AO4. The assessment grid sub-divides the total mark to allocate for a question. These are shown in bands in the mark scheme. For each question, descriptors will indicate the different skills and qualities at the appropriate level.

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

Stage 1 – Deciding on the band

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

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

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

Stage 2 – Deciding on the mark

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

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

Question 1

		AO3	AO4	Mark
(a)	Name the manufacturing process used to produce the water bottles shown below and name the polymer used to manufacture the transparent bottle.		✓	2
	<p><i>Answers that correctly name the process and a suitable polymer used can be awarded up to 2 marks based on:</i></p> <p><i>Process:</i> blow moulding or injection blow moulding. <i>Polymer name (accept PET, Low Density Polyethylene (LDPE) High Density Polyethylene (HDPE), Polyethylene Terephthalate (PET), Polypropylene (PP), Polyvinyl Chloride (PVC).</i></p> <p>Guidance to markers</p> <p><i>Incorrect / no answer.</i> 0</p> <p><i>Blow moulding named as the process</i> 1</p> <p><i>A suitable named polymer</i> 1</p>			
(b)	Explain the benefits of using this type of polymer and production process to the manufacturer when manufacturing the water bottles shown.		✓	6
	<p><i>Answers that indicate an understanding of this production method and suitable polymers can be awarded up to 6 marks based on:</i></p> <ul style="list-style-type: none"> • The endless shape and form possibilities that are available to the designer/manufacturer. • Anthropometric features can be an important feature (grip, handling in different situations). • The lightness of the product even when full of water in comparison to glass containers. • The recycling possibilities available. • Storage and packing are made easier because of shape and form in addition to lightness in bulk • The transportation of palettes in bulk. • Mass production – low cost following initial set up process. • No breakages and the process may be used in the manufacture of baby bottles. • The large range of forms and designs available – also in terms of volume. • Economic and tough – very economical to make and safe to use. • Energy saving in production in comparison to traditional glass containers. • Flexibility in production allows for different labelling. 			

<ul style="list-style-type: none"> Incorrect/no answer 	0	
<ul style="list-style-type: none"> Candidate has a simplistic knowledge. The use of terminology and technical language is basic. Brief description of process with limited reference to a suitable polymer. 	1-2	
<ul style="list-style-type: none"> The candidate has a basic understanding of the issues associated with the question. The use of terminology and technical language is reasonably accurate. More detailed description of process with some reference to a suitable polymer. 	3-4	
<ul style="list-style-type: none"> The candidate demonstrates a clear understanding of the issues associated with the question. Uses correct terminology and technical language. Fully detailed understanding of the process with clear reference to a suitable polymer. 	5-6	
Total		8

Question 2

		AO3	AO4	Mark
(a)	There are distinct stages to a product life cycle as shown in the graph above. Describe the four stages that follow the introduction or launch of the new car.		✓	4
	<p><i>Answers that indicate an understanding of a product life cycle can be awarded up to 4 marks for each detailed descriptor.</i></p> <p>Guidance to markers:</p> <p><i>Incorrect / no answer</i></p> <p><i>Stated stage with correct description based on:</i></p> <p>Growth/stage 2 Is the point at where the sales of the car begin to increase because of customer popularity.</p> <p>Maturity/stage 3 – Is the peak point where the sales of the car are at its greatest.</p> <p>Decline/stage 4 – Is the point at where the car sales have started to fall and the car is ready for further design changes to maintain popularity.</p> <p>Obsolescence/stage 5 – Is the point at which there is little or no demand for the car and it is taken off the market.</p>			0
				1
				1
				1

Question 2

		AO3	AO4	Mark
(b)	Describe what strategies a manufacturer could employ when the car reaches point A on the graph that could extend the life of the car.		✓	4
	<p><i>Answers that indicate an understanding of strategies to extend the life of the car can be awarded up to 4 marks based on:</i></p> <ul style="list-style-type: none"> • An extension strategy is a practice used to increase the market share for a given product or service and thus keep it in the maturity phase of the marketing product lifecycle rather than going into decline. • Product extension is the strategy of placing an established product's brand name on a new product that is in the same category. Small companies can deploy the practice in the same way that large firms have, in order to increase sales of a popular product by offering variations. • Brand extension or brand stretching is a marketing strategy in which a firm marketing a product with a well-developed image uses the same brand name in a different product category. The new product is called a spin-off. • A product line extension is when a company creates a new product in the same product line of an existing brand. The strategy for an extension could be a different colour or size. <p>Answers must relate to a car and no other products.</p> <p>Guidance to markers:</p> <p>Incorrect/no answer 0</p> <p>Brief description with little detail or reference to extension strategy for example: <i>An updated version may be introduced at point A.</i> 1</p> <p>Some detail in description, with some understanding of different extension strategies for example: <i>A new developed version of the car may be introduced with possibly new components or better styling at point A</i> 2</p> <p>A more detailed understanding with clear understanding of different extension strategies for example: <i>An extension strategy is introduced to prolong the life of the existing car for example through new styling and a new brand name.</i> 3</p> <p>Fully detailed description with clear understanding of different extension strategies for example: <i>Extension strategies may be introduced at point A where the company will market a new/improved version in order to increase sales. This will increase sales without developing a completely new version and without the need to set up a completely new production line.</i> 4</p>			
			Total	8

Question 3

		AO3	AO4	Mark
(a)	Explain how ergonomics is critical for the supermarket checkout operator shown in the picture below.		✓	4
	<p><i>Answers that indicate an understanding of ergonomics can be awarded up to 4 marks based on:</i></p> <ul style="list-style-type: none"> • Ergonomics is the study of how equipment and furniture can be arranged in order that people can do work or other activities more efficiently and comfortably. • The discipline of ergonomics is aimed at ensuring that the design of products, processes and environments results in optimised performance, safety and wellbeing of the user. • Ergonomics is consideration of the task and equipment to user. • Ergonomics is a branch of science that aims to learn about human abilities and limitations, and then apply this learning to improve people's interaction with products, systems and environments. • Answers could relate to size, shape, weight, light, sound, moving of products in the supermarket, barcodes, hand scanner etc. Candidates should explain/discuss the points mentioned. <p>Accept any two appropriate answers that are explained.</p> <p>Guidance to markers:</p> <p>Incorrect/no answer</p> <p>Brief description with little detail or reference to ergonomics for example: <i>The operator can handle items easily as they pass the scanner area.</i></p> <p>Some detail in description, with some understanding of ergonomics for example: <i>As ergonomics is the study of how equipment is arranged properly, these factors are critical here in order for the operator to reach items easily bigger items could require the use of a hand-held scanner.</i></p>			0 1 2 3 4

Question 3

		AO3	AO4	Mark
(b)	Study the picture below and explain how anthropometric data has been applied in the successful design of the chair and desk.		✓	8
<p><i>Answers that indicate an understanding of Anthropometrics should be awarded up to 8 marks based on:</i></p> <ul style="list-style-type: none"> • Understanding the term. • The study of the human body and its movement, involving research into measurements relating to people. • It also involves collecting statistics or measurements relevant to the human body <p>Chair:</p> <ul style="list-style-type: none"> • Chair ensures body and head are straight. • Back rest is adjusted to support the lumbar region of the spine. • Allows adequate leg clearance. • Feet rest firmly on the ground or can be supported by foot rests. <p>Desk:</p> <ul style="list-style-type: none"> • Height of desk places the hands in a comfortable position. • Wrists also in a neutral position. • Optimum height for working at the desk i.e. with computer monitor. • Sufficient height clearance under desk. <p>Guidance to markers: Award up to four marks for reference to the chair. Award up to four marks for reference to the desk.</p>				
Total				8

Guidance to markers:	
<ul style="list-style-type: none"> • Candidate has a simplistic knowledge. • The use of terminology and technical language is basic. • The candidate has little understanding of anthropometrics and the insights gained. 	0-2
<ul style="list-style-type: none"> • The candidate has a basic understanding of the issues associated with the question. • The use of terminology and technical language is variable. • The candidate understands the general elements of anthropometrics and the impact on the design of chair and desk. 	3-4
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • The use of terminology and technical language is reasonably accurate. • The candidate understands the general elements of Anthropometrics and the impact on the design of chair and desk. 	5-6
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • Uses correct terminology and technical language. • The candidate clearly understands the main feature of Anthropometrics and how it impacts on the successful design of the chair and desk. 	7-8

Question 4

		AO3	AO4	Mark
(a)	Explain what you understand by the term galvanising and state the advantages of using this process in the manufacture of the chassis.		✓	4
	<p><i>Answers that indicate an understanding of galvanising steel and its advantages can be awarded up to 4 marks based on:</i></p> <p><i>Hot-dip galvanizing is a common process of immersing steel in a bath of molten zinc to produce a corrosion resistant coating for the metal. While the steel is immersed in the zinc, a metallurgical reaction occurs between the iron in the steel and the molten zinc. The coating adheres to all surfaces creating a uniform thickness throughout the part.</i></p> <p>Advantages to the manufacturing process:</p> <ul style="list-style-type: none"> • Produces a high-quality anti rust protection for the steel. • Can be stored outside once manufactured – in preparation for assembling the body of the trailer. • It is a high-volume production process. • The trailer’s product life extended greatly. • No maintenance is required once the process is completed. • It is excellent protection against the elements i.e. cold weather conditions, salty weather conditions or very hot conditions. • Aesthetics – many consumers like the fact that the galvanising finish is something that is appealing. <p>Guidance to markers:</p> <p>Incorrect/no answer 0</p> <p>Brief description with little detail or reference to galvanizing for example: <i>It is a basic coating for the mild steel, so it will not rust.</i> 1</p> <p>Some detail in description, with some understanding of galvanizing and its advantages for example: <i>It is a coating of zinc on to mild steel to provide a long-term coating to protect the steel from the elements.</i> 2</p> <p>A more detailed understanding with clear understanding of galvanizing and its advantage for example: <i>Galvanizing is using hot zinc in which steel is dipped into. This provides a permanent coat to protect the steel for the elements.</i> 3</p> <p>Fully detailed description with clear understanding of galvanizing and its advantage as a process for protection for example: <i>Hot dip galvanizing is used to coat mild steel and provide a permanent protective layer for the steel. The advantages during manufacture is that it is a quick process and in this case the trailer chassis can be left outside for storage until it is ready for the remainder of the assembly process.</i> 4</p>			

Question 4

		AO3	AO4	Mark
(b)	Describe how the manufacturer has incorporated a different surface finish to each of the labelled parts on the garden tools shown below and explain the benefits of both surface finishes to the user.		✓	8
<p><i>Answers that indicate an understanding of surface finishing processes can be awarded up to 8 marks based on:</i></p> <p><i>Using an Injection moulded handle</i></p> <ul style="list-style-type: none"> • This allows for a variety of shaped handles and can be formed for easy grip. • Process: The polymer is injected into a prepared mould tool that defines the shape of the moulded part (handle). • Using this process allows the designer/manufacturer to design suitable not slip handles and considers good anthropometric features. • Benefits the user in form, grip and also provides colour variations. <p><i>Surface coating for steel</i></p> <ul style="list-style-type: none"> • Primed and painted to protect the steel for rusting • Enamelled steel provides a more permanent coating to protect the fork from the elements • Benefits the user with not having to use a protective layer once purchased. • Enamelled or stove enamelled coating will be permanent and require very little or no maintenance. <p><i>Accept descriptions that could be related to wood/metal handles/rubber handles/rubber sleeves.</i></p>				
Guidance to markers:				
<ul style="list-style-type: none"> • Candidate has a simplistic knowledge. • The use of terminology and technical language is basic. • The candidate has little understanding of surface finishes 				0-2
<ul style="list-style-type: none"> • The candidate has a basic understanding of the issues associated with the question. • The use of terminology and technical language is variable. • The candidate understands some of the general elements of two areas of surface finishes and the benefits to the user. 				3-4
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • The use of terminology and technical language is reasonably accurate. • The candidate understands the general elements of surface finishes and the benefits to the user. 				5-6
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • Uses correct terminology and technical language. • The candidate clearly understands the main features of surface finishes and the benefits to the user. 				7-8
			Total	12

Question 5

		AO3	AO4	Mark
(a)	Describe the importance and benefits of CAD during the design and development stages of the new folding push scooter.		✓	4
	<p><i>Answers that indicate an understanding of CAD can be awarded up to 4 marks based on:</i></p> <ul style="list-style-type: none"> • Manipulation on screen – the drawing can be adjusted, stretched with a variety of different components added. • During the design and development stages, the designer may place the scooter in different environments to show clients. • The design and development stage will allow for planning component manufacture – stress tests may also be carried out on different sections. • The scooter will be prepared for assembly planning – making the best use of components. • Aesthetic detailing can be added providing possible feedback from clients <p>Guidance to markers:</p> <p>Incorrect/no answer</p> <p>Brief description with little detail or reference to CAD for example: <i>CAD allows you to plan your scooter for manufacture.</i></p> <p>Some detail in description, with some understanding of CAD for example: <i>CAD is important during the design and development stages in order to plan out the construction of the scooter. It allows you to change things very quickly on screen</i></p>			0 1 2

Question 5

		AO3	AO4	Mark
(b)	Describe two advantages to the manufacture of using pre-production prototyping when developing the new folding push scooter.		✓	4
	<p><i>Answers that indicate an understanding of the advantages of pre-production prototyping can be awarded up to 2 marks for each advantage based on:</i></p> <ul style="list-style-type: none"> • <i>Test various design features</i> • <i>Test material suitability</i> • <i>Verify design functionality</i> • <i>Review initial product shapes or branding images</i> • <i>Gain feedback from customers or early adopters</i> • <i>Use the prototype as a test-bed for developing additional features</i> • <i>Identify issues as early as possible within the development stage and before going to production.</i> <p>• <i>Provides a physical model for company stakeholders to review and obtain a greater understanding of the product</i></p> <p>Guidance to markers:</p> <p><i>Incorrect/no answer</i></p> <p><i>Brief description with little detail or reference to pre-production prototyping for example: Prototyping allows you to see the final product and handle it.</i></p> <p><i>Some detail in description, with some understanding of pre-production prototyping for example: Pre-production prototyping allows the product manufacturer to test various parts of the product before going into manufacture.</i></p> <p><i>A more detailed understanding with clear understanding of pre-production prototyping for example: Prototyping allows the manufacturer to see a three-dimensional model of the product and this can be evaluated by the manufacturer and possibly client. It also tests the product's function and sees if the materials used are suitable.</i></p> <p><i>Fully detailed description with clear understanding of pre-production prototyping for example: Prototyping allows the manufacturer to see a fully functional three-dimensional model of the product. This can be evaluated by the manufacturer and possibly clients for feedback. The manufacturer tests the product's function and sees if the materials used are suitable. This will minimize the risk to the product before going into production</i></p>			0 1 2 3 4
			Total	8

Question 6

	AO3	AO4	Mark
Evaluate how the use of standardised bought-in components benefits the manufacturer when assembling products on the production line.	✓		8
<p><i>Answers that indicate an understanding of the bought in components on a production line can be awarded up to 8 marks based on:</i></p> <p>Note: Reference could be made to: nuts and bolts, washers and small-scale fittings Benefits would include:</p> <ul style="list-style-type: none"> • The quality of the bought in components is the responsibility of the external supplier. • There is less factory space required in the main manufacturing area. • All the components arrive 'JIT' – directly to the cell or production line. • Bought in parts ensures consistency on terms of material, quality. • Less skill is required by staff, so they will be able to concentrate on the main assembly/manufacturing processes. • There will be less specialist equipment needed to produce the bought in components. • This will reduce costs as less staff and equipment are required. • All the components may be bought in bulk – but delivered at a time which is suitable for the manufacturer. 			
Guidance to markers:			
<ul style="list-style-type: none"> • Candidate has a simplistic knowledge. • The use of terminology and technical language is basic. • The candidate has little understanding of the benefits of using bought in components. 		0-2	
<ul style="list-style-type: none"> • The candidate has a basic understanding of the issues associated with the question. • The use of terminology and technical language is variable. • The candidate understands some of the general benefits of using bought in components. 		3-4	
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • The use of terminology and technical language is reasonably accurate. • The candidate understands the general benefits of using bought in components to the manufacturer. 		5-6	
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • Uses correct terminology and technical language. • The candidate clearly understands the how the use of standardised bought-in components benefits the manufacturer when assembling products on the production line. 		7-8	
Total			8

Question 7

		AO3	AO4	Mark
(a)	Modern tennis racquets often use carbon fibre in their construction. Describe the advantages of using carbon fibre in the manufacture of this product.		✓	4
	<p><i>Answers that indicate an understanding of a carbon fibre and its characteristics can be awarded up to 4 marks based on:</i></p> <p>Advantages:</p> <ul style="list-style-type: none"> • The increased relative strength and malleability of carbon fibre allow new racket designs that were impossible to create with wood. • The increased strength of carbon fibre rackets in all directions allows them to be strung with less risk of breakage or damage to the frame. And it also makes them much less likely to break during play. • Carbon fibre allow the distribution of the weight around the racket to be managed much more accurately and specifically. This means that rackets can be weighted to suit more playing and swing styles, and to allow both weaker and stronger players to have characteristics that suit them, including weight, balance, and swing weight. • Carbon fibre rackets make it easier to attach (and replace) a separate handle, made of materials optimized for that task. • Another advantage of carbon fibre is that they allow the manufacturers to manage the flex pattern of the racket. In other words, by managing the relative stiffness at various points on the frame, they can adjust where and how the racket flexes during play. • Carbon composite rackets are relatively immune to changes in humidity and temperature, and therefore don't warp like wood rackets used to sometimes. <p>Guidance to markers:</p> <p><i>Incorrect/no answer</i></p> <p>Brief description with little detail or reference to carbon fibre for example: <i>Carbon fibre is as strong as steel and will last a long time</i></p> <p>Some detail in description, with some understanding of carbon fibre for example: <i>Carbon fibre has good strength to weight ratio and is flexible to be used for rackets.</i></p> <p>A more detailed understanding with clear understanding of carbon fibre for example: <i>An increased strength and malleability of carbon fibre allow new racket designs to be made that were nor possible with wood. Carbon fibre is also very flexible, and each individual racket can be designed for a specific player.</i></p> <p>Fully detailed description with clear understanding of carbon fibre for example: <i>Increased strength and malleability using carbon fibre allows new racket designs to be made that were nor possible with wood. It is also very flexible, and each individual racket can be designed for a specific player. Each racket will withstand temperature changes and fluctuations in humidity (this is a problem with wooden ones).</i></p>			0 1 2 3 4

Question 7

		AO3	AO4	Mark
(b)	Spectacle frames often incorporate smart materials in their construction. Describe the advantages of using smart materials in the manufacture of this product.		✓	4
	<p><i>Answers that indicate an understanding of a Smart material and its characteristics can be awarded up to 4 marks based on:</i></p> <p>SMART Material: Smart alloys</p> <p>Advantages:</p> <ul style="list-style-type: none"> • Spectacle frames made from smart alloys demonstrate that they can be bent back and forth, and retain their shape. These frames are made from smart alloys and demonstrate super-elasticity • Smart alloys have unusual properties. Nitinol is an alloy of nickel and titanium, and is known as a shape memory alloy. If nitinol is bent out of shape, it returns to its original shape when it is either heated or an electric current is passed through it • Nitinol has a property that makes it useful for making spectacle frames - it returns to its original shape if put in hot water after bending. Nitinol is an alloy of nickel and titanium, and is known as a shape memory alloy. If nitinol is bent out of shape, it returns to its original shape when it is either heated or an electric current is passed through it. • A shape-memory alloy (SMA, smart metal, memory metal, memory alloy, muscle wire, smart alloy) is an alloy that "remembers" its original shape and that when deformed returns to its pre-deformed shape when heated. <p>Answers must relate to the spectacle frames and not the lens.</p> <p>Guidance to markers:</p> <p><i>Incorrect/no answer</i></p> <p>Brief description with little detail or reference to smart alloys for example: <i>The advantages of using smart materials in the manufacture of this product it is a very flexible material and will not break.</i></p> <p>Some detail in description, with some understanding of smart alloys for example: <i>The advantages of using a material such as an alloy in the manufacture of spectacle frames is it can be crushed and will eventually return to its original shape as it is a smart material.</i></p> <p>A more detailed understanding with clear understanding of smart alloys for example: <i>The advantages of using smart materials such as memory alloys or memory metals in the manufacture of this product is that it remembers its original shape and will return to it if the frame is crushed.</i></p> <p>Fully detailed description with clear understanding of smart alloys for example: <i>The advantages of using smart materials such as a smart memory alloy (usually titanium) in the manufacture of this product is it will return to its original form if crushed. The frame is usually heated, or an electrical current may be passed through it - and is made from smart alloys and demonstrate super-elasticity. It remembers its original shape and that when deformed returns to its pre-deformed shape when heated.</i></p>			0
				1
				2
				3
				4

Question 7

		AO3	AO4	Mark
(c)	Many bicycle frames, originally made from tubular steel, are now made from aluminium alloys. Describe why aluminium alloys are now used in place of tubular steel.		✓	4
<p><i>Answers that indicate an understanding of alloys and its characteristics when compared to tubular steel can be awarded up to 4 marks based on:</i></p> <ul style="list-style-type: none"> • Bicycle frames are commonly made from aluminium alloy and each alloy can have different characteristics. An alloy (technically) is a metal with other things added to improve some of its properties. Lots of mass-production bikes are now being made out of aluminium alloy. • Aluminum alloy is the most widely available lightweight bike frame material. Steel, the most common and oldest bike frame material, is approximately three times the weight of aluminum alloy. Aluminum alloy frames require no substantial design changes to remain among the lowest-weight bikes available. Due to its naturally low weight, aluminum alloy remains an ideal and affordable choice for racing and mountain bike frames. • Aluminum alloy bike frames are not prone to rust. This resistance to rust makes it very low-maintenance and ideal for mountain biking and touring cyclists, or for any hobby cyclist who regularly rides in wet conditions. Thicker-than-standard tubes can be used in aluminum bike frames without making them significantly heavier. • Though generally more expensive than comparable steel frames, aluminum alloy frames are still relatively inexpensive. Due to their durability, rust resistance, stability and low weight, aluminum alloy frames can suit the needs of a range of riders. While the benefits of this frame may not compare with those of some titanium and carbon fibre bikes <p>Guidance to markers:</p> <p><i>Incorrect/no answer</i> 0</p> <p>Brief description with little detail or reference to why aluminium alloys are now used in place of tubular steel for example: <i>Alloys are used because they will not rust like steel and are very lightweight which makes the bike a lot lighter.</i> 1</p> <p>Some detail in description, with some understanding of why aluminium alloys are now used in place of tubular steel for example: <i>Aluminum alloy is the most lightweight bike frame material. Steel, the most common and oldest bike frame material, is significantly heavier than aluminum alloy. Aluminum alloy frames require little design changes to remain among the lowest-weight bikes available. It has an overall low weight.</i> 2</p> <p>A more detailed understanding with clear understanding of why aluminium alloys are now used in place of tubular steel for example: <i>In addition to being very lightweight yet strong Aluminum alloy bike frames will not rust. This makes it very low-maintenance and ideal for mountain biking and touring cyclists. Thicker-than-standard tubes can be used in aluminum bike frames without making them a lot heavier.</i> 3</p> <p>Fully detailed description with clear understanding of why aluminium alloys are now used in place of tubular steel for example: <i>Although they can be more expensive than steel frames, aluminum alloy frames are still relatively inexpensive. Due to their durability, rust resistance, stability and low weight, aluminum alloy frames can suit the needs of a range of riders. Frames are commonly made from aluminium alloy and each alloy can have different characteristics depending on the type of bike – where an alloy is a metal with other things added to improve some of its properties.</i> 4</p>				
Total				12

Question 8

		AO3	AO4	Mark
(a)	Explain how quality control and quality assurance ensure the production of high quality products.		✓	6
<p><i>Answers that indicate an understanding of quality control and quality assurance can be awarded up to 6 marks based on:</i></p> <ul style="list-style-type: none"> • Although QA and QC are closely related they are both aspects of quality management, they are fundamentally different in their focus: QA is the process of managing for quality and QC is used to verify the quality of the output or product. • Quality control means checking during the making of a product to make sure that it is being made to the required standard. • Quality assurance means making sure that a product is of the best quality that can be achieved. At all stages from the designer to the user, checks will be made to ensure that everything is of the highest possible quality. • QA/QC is the combination of quality assurance, the process or set of processes used to measure and assure the quality of a product, and quality control, the process of ensuring products and services meet consumer expectations. • Quality assurance is process oriented and focuses on defect prevention, while quality control is product oriented and focuses on identifying defects in the product i.e. dimensions, material quality, weight or surface finish. • Simply put, Quality Assurance focuses on the process of quality, while Quality Control focuses on the quality of output. 				
<ul style="list-style-type: none"> • Incorrect/no answer 		0		
<ul style="list-style-type: none"> • Candidate has a simplistic knowledge. • The use of terminology and technical language is basic. • Brief description of how quality control and quality assurance ensure the production of high-quality products. 		1-2		
<ul style="list-style-type: none"> • The candidate has a basic understanding of the issues associated with the question. • The use of terminology and technical language is reasonably accurate. • More detailed description of how quality control and quality assurance ensure the production of high-quality products. 		3-4		
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • Uses correct terminology and technical language. • Fully detailed understanding of how quality control and quality assurance ensure the production of high-quality products. 		5-6		

Question 8

		AO3	AO4	Mark								
(b)	Discuss the importance of quality control to the manufacturer and consumer.		✓	6								
<p><i>Answers that indicate an understanding of QC to the manufacturer and consumer and can be awarded up to 6 marks based on:</i></p> <p>Manufacturer:</p> <ul style="list-style-type: none"> Quality control is a process that ensures customers receive products free from defects and meet their needs. Manufacturers also have accredited safety tests applied to products shown by approved certification. A quality control system based on a recognised standard, such as ISO 9001, provides a strong foundation for achieving a wide range of marketing and operational benefits. Building confidence in a product brand ensures steady sales for the manufacturer. <p>Consumer:</p> <ul style="list-style-type: none"> Consumer service operations are designed to keep customers satisfied while protecting the organisation. Kite marks may be applied to products. In manufacturing, quality control is a process that ensures customers receive products free from defects and meet their needs. When done the wrong way, it can put consumers at risk and may result in product recalls. <table border="1"> <tbody> <tr> <td> <ul style="list-style-type: none"> Incorrect/no answer </td> <td>0</td> </tr> <tr> <td> <ul style="list-style-type: none"> Candidate has a simplistic knowledge. The use of terminology and technical language is basic. Brief description of how quality control is important to the manufacturer and consumer. </td> <td>1-2</td> </tr> <tr> <td> <ul style="list-style-type: none"> The candidate has a basic understanding of the issues associated with the question. The use of terminology and technical language is reasonably accurate. More detailed description of how quality control is important to the manufacturer and consumer. </td> <td>3-4</td> </tr> <tr> <td> <ul style="list-style-type: none"> The candidate demonstrates a clear understanding of the issues associated with the question. Uses correct terminology and technical language. Fully detailed understanding of how quality control is important to the manufacturer and consumer. </td> <td>5-6</td> </tr> </tbody> </table>					<ul style="list-style-type: none"> Incorrect/no answer 	0	<ul style="list-style-type: none"> Candidate has a simplistic knowledge. The use of terminology and technical language is basic. Brief description of how quality control is important to the manufacturer and consumer. 	1-2	<ul style="list-style-type: none"> The candidate has a basic understanding of the issues associated with the question. The use of terminology and technical language is reasonably accurate. More detailed description of how quality control is important to the manufacturer and consumer. 	3-4	<ul style="list-style-type: none"> The candidate demonstrates a clear understanding of the issues associated with the question. Uses correct terminology and technical language. Fully detailed understanding of how quality control is important to the manufacturer and consumer. 	5-6
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		Total		12								

Question 9

		AO3	AO4	Mark										
(a)	Describe what you understand by the term 'market segmentation' and explain its importance in the development of new products.		✓	8										
<p><i>Answers that indicate an understanding of the term market segmentation can be awarded up to 8 marks based on:</i></p> <ul style="list-style-type: none"> • <i>Market segmentation is the term to describe the division of a market of potential customers into groups, or segments, based on different characteristics.</i> • <i>The segments created are composed of consumers who will respond similarly to marketing strategies.</i> • <i>The segments share traits such as similar interests, needs, or locations.</i> • <i>Its objective of market segmentation is to design a marketing mix that precisely matches the expectations of customers in the targeted segment.</i> • <i>They are important to the design of new products as segments may be targeted to suit the product – providing vital information to its future success.</i> • <i>Manufacturers or companies will not survive if the marketing strategy is dependent upon targeting an entire mass market - the importance of market segmentation is that it allows a business to precisely reach a consumer with specific needs and wants</i> 														
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Question 10

	AO3	AO4	Mark
James Dyson is well known for his innovative approach to product design. Analyse the impact that his products have had on the market place.	✓		12
<p><i>Candidates should demonstrate knowledge and understanding of James Dyson's work and apply it to designing and making principles to be awarded up to 12 marks based on:</i></p> <p>The impact of James Dyson's work on the market place and his innovative approach based on:</p> <ul style="list-style-type: none"> • <i>Dyson invented his first Dual Cyclone vacuum cleaner, which hit stores in 1993. Before that he spent 15 years creating 5,126 versions that failed before he made one that worked. The payoff was a multi-billion dollar company known for its creativity, innovation and forward-thinking designs.</i> • <i>Sir James Dyson lives in a world where products are typically released to the public as quickly as possible, Dyson and his team work through hundreds and sometimes even thousands of prototypes of a product before the public sees them.</i> • <i>Using energy and materials sparingly and ingeniously is a prerequisite of Dyson's work. His bladeless fan and hand dryers and good examples of these principles.</i> • <i>His products have impacted greatly on the market place and basically began with breaking the monopoly of the traditional vacuum cleaner with his new dual cyclone technology. His company continually evolve new innovative products such as the bladeless fans and hair dryers incorporating new technology.</i> • <i>Dyson's innovative quality has always been the ability to look at the ordinary tools of everyday life – things people take for granted – and find ways to improve them.</i> • <i>The impact of his products against competitors and how his market has grown significantly over the years.</i> 			
Total			12

Guidance to markers:	
<ul style="list-style-type: none"> • Candidate has a simplistic knowledge. • The use of terminology and technical language is basic. • Responses consider some aspects at a basic level in relation to designing sustainable products. • Responses outline his innovative approach to product design at a basic level. There is some analysis of the impact that his products have had on the market place. • There will be errors of grammar, punctuation and spelling. 	0-3
<ul style="list-style-type: none"> • The candidate has a basic understanding of the issues associated with the question. • The use of terminology and technical language is variable. • Responses consider the two areas superficially. • Responses outline his innovative approach to product design with a range of products outlined, and there is some analysis of the impact that his products have had on the market place. • There will be few errors of grammar, punctuation and spelling. 	4-6
<ul style="list-style-type: none"> • The candidate demonstrates some understanding of the issues associated with the question. • Uses correct terminology and technical language. • Responses must consider the two areas in relation to designing sustainable products. • Responses detail his innovative approach to product design with some relevant examples included. There is further analysis of the impact that his products have had on the market place. • There will be few errors of grammar, punctuation and spelling. 	7-9
<ul style="list-style-type: none"> • The candidate demonstrates a clear understanding of the issues associated with the question. • Uses correct terminology and technical language. • Responses detail his innovative approach to product design with a good range of examples included and detailed in terms of innovation. • There is further analysis of the impact that his products have had on the market place. • A range of environmental issues highlighted by the candidate (energy, cost, investment, environmental footprint). • There will be few, if any, errors of grammar, punctuation and spelling. 	10-12