GCE A LEVEL MARKING SCHEME

SUMMER 2024

A LEVEL
DESIGN AND TECHNOLOGY - UNIT 3
PRODUCT DESIGN
1603U30-1

About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

GCE A LEVEL DESIGN AND TECHNOLOGY

UNIT 3 – PRODUCT DESIGN

SUMMER 2024 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

The acrylic trophy below has been glued together using liquid Tensol cement.		AO3	AO4	Mark
(a)	When using Tensol cement the manufacturer needs to follow COSHH regulations. (i) State what the letters in the term COSHH stand for.		✓	1
	• Control of Substances Hazardous to Health			**1**
(a)	(ii) Discuss the key aspects the manufacturer would need to consider when working to COSHH regulations.		✓	4
	*Answers that indicate an understanding of key aspects of COSHH regulations should be awarded up to **4** marks based on:* • COSHH is the law that requires employers to control substances that are hazardous to health. You can prevent or reduce workers exposure to hazardous substances by: o finding out what the health hazards are; o deciding how to prevent harm to health (risk assessment); o providing control measures to reduce harm to health; o keeping all control measures in good working order, including appropriate PPE; o providing information, instruction and training for employees and others; o providing monitoring and health surveillance in appropriate cases; o planning for emergencies; o providing data sheets for substances; o storing substances and materials appropriately. o Use of appropriate coloured storage cupboards. **Guidance to markers** *Incorrect/no answer* *One consideration given with no explanation, for example*: A consideration that the manufacturer would need to undertake would be to ensure risk assessments are in place. *Two considerations given with no explanations, for example*: A consideration that the manufacturer would need to undertake would be to ensure risk assessments are in place. A second consideration would be to ensure training is provided to employees. *Detailed considerations with clear explanations, for example:* A consideration that the manufacturer would need to undertake would be to ensure risk assessments are in place, this would allow for the hazards to be identified and allow control measures to be put into place. Another aspect to be considered would be to ensure training is provided to employees. *More detailed considerations with clear explanations, for example:* A consideration that the manufacturer would need to undertake would be to ensure risk assessments are in place, this would allow for the hazards to be identified and allow control measures to be put into place. Another aspect to be considered would be to ensure training is provided to employees. The training would allow for the correct handling of substances in accordance with data sheets for the materials.			**0** **1** **2** **3** **4**

(b)	Explain a property of liquid Tensol cement that makes it an appropriate adhesive for the trophy.		✓	2
	Answers that indicate an understanding of properties of Tensol Cement should be awarded up to **2** *marks based on:* • Tensol cement is a type of glue called 'dichloromethane methyl methacrylate' and produces a chemical weld between two surfaces. • A clear liquid with a solvent base which is easy to apply with a syringe. • Works by reacting with the surface 'melting' and welding the surfaces together. • Leaves an invisible join, improving aesthetics. • A strong adhesive to hold 2 pieces of acrylic together. **Guidance to markers** *Incorrect/no answer* *Property given with no explanation, for example*: Tensol cement is a clear liquid that provides a bond. *Full explanation of a property, for example*: Tensol cement is a clear liquid that provides a chemical bond to weld the acrylic together leaving an invisible join.			**0** **1** **2**
			Total	**7**

Question 2

The micro drone below has been developed using CAD.		AO3	AO4	Mark
(a)	Explain two advantages of stress testing the product using CAD simulation.		✓	2 x [2]
	Answers that indicate an understanding of CAD simulation *should be awarded up to **4** marks based on:* • Identify potential failures and to simulate forces that could be placed on the drone when flying. • Finding the problems before an actual physical model is made. • Simulate real world environments to identify weak points. • Testing of different materials to identify most suitable. • Saving time and resources. • Possibility to produce calculations, to comment and adapt on the findings. **Guidance to markers** *Incorrect/no answer* **0** *Brief description of one advantage, for example*: CAD simulation will allow for the drone's materials to be tested under specific forces. **1** *More detailed explanation with clear understanding, for example:* Stress testing using CAD simulations can allow for forces to be applied to computer models to determine suitability of materials and identify the potential failure points of the materials on the drone frame. **2** ***Award 2 marks maximum for each advantage.***			

(b)	The U.K. based designer has decided to manufacture the micro drone in the Far East. Explain **one** benefit and **one** drawback to this global manufacture.		✓	2 x [2]

*Answers that indicate an understanding of benefits and drawbacks for global manufacturing should be awarded up to **4** marks based on:*

Benefits:

- Lower production costs – materials, labour, rent, energy.
- Cheaper products due to no need to purchase machinery (outsourcing).
- Increased availability and variety of products.
- Cultural diversity, as people move around the world following employment.

Drawbacks:

- Unemployment left in UK.
- Increased pollution and environmental damage due to carbon footprint.
- Social unrest in certain countries.
- Poor working conditions in 3rd world countries working for lower wage.
- Health and safety can be ignored or is less important, compromising the safety of workers.
- Communication issues with manufacturer.

Guidance to markers - Benefits

Incorrect/no answer	**0**
Brief description of one benefit, for example: One benefit for global manufacture would be that there could be cheaper labour costs.	**1**
More detailed explanation with clear understanding of benefit, for example: A main drawback for global manufacturing the drone in the far east would be that there would be cheaper production costs due to the lower wages that are paid compared to a UK manufacturing workforce.	**2**

Guidance to markers - Drawbacks

Incorrect / no answer	**0**
Brief description of one drawback, for example: One drawback for global manufacture could be a negative effect on the UK workforce causing unemployment.	**1**
More detailed explanation with clear understanding of drawback, for example: A main drawback for global manufacturing the drone in the far east would be that there are poor working conditions in 3rd world countries working for lower wage resulting in health and safety being less important, compromising the safety of workers.	**2**

Total	**8**

Question 3

The following products have been developed by incorporating different smart materials.		AO3	AO4	Mark
(a)	**Ski goggles** State an appropriate smart material that has been incorporated into the ski goggles lens and describe the properties that make it suitable.		✓	4

*Answers that indicate an understanding of an appropriate smart material should be awarded up to **4** marks based on:*

Smart Material – Photochromic lens

Properties to include:

- Photochromic materials are those which react reversibly to UV light.
- Molecules of silver chloride are embedded in photochromatic lenses.
- Inside the lenses remain clear, but they darken when outside in sunlight.
- They darken significantly within about a minute of exposure to bright light and can continue to darken up to 15 minutes afterwards.
- The lens can protect and filter against UV rays making it suitable for the ski goggles.

Guidance to markers

Incorrect/no answer	**0**
Identification of smart material, for example: Photochromic lens.	**1**
Named material and description of one property, for example: The ski goggles could incorporate a photochromic lens, which reacts to UV light.	**2**
Named material and more detailed description of range of properties, for example: The ski goggles could incorporate a photochromic lens, which reacts to UV light so when worn inside the lenses remain clear, but they darken when outside in sunlight. The lens will protect against some UV rays.	**3**
Named material and fully detailed descriptions of range of properties, for example: The ski goggles could incorporate a photochromic lens, which reacts to UV light due to molecules of silver chloride which are embedded in photochromatic glass lens. This means when worn inside the lenses remain clear, but they darken when outside in sunlight. The lens will protect against some UV rays.	**4**

(b)	**Smart aircraft window** State an appropriate smart material that has been incorporated into the smart aircraft window and describe the properties that make it suitable.		✓	4
	*Answers that indicate an understanding of an appropriate smart material should be awarded up to **4** marks based on:* Smart Material – Electrochromic glass Properties to include: • Electrochromic Glass can change from opaque to clear with a flick of a switch. • It works by passing low-voltage electrical charges across a microscopically thin coating on the glass surface, activating an electrochromic layer which changes colour from clear to dark. • The electric current can be activated manually or by sensors which react to light intensity. • A burst of electricity is required for changing its opacity, but once the change has been made, no electricity is needed for maintaining the particular shade which has been reached. • Reversing the voltage moves ions from the electrochromic layer back to the counter-electrode layer, restoring the device to its previous clear state. **Guidance to markers** *Incorrect/no answer* **0** *Identification of smart material, for example*: Electrochromic glass. **1** *Named material and description of one property, for example*: The aircraft window could incorporate electrochromic glass which can change from opaque to clear with a flick of a switch. **2** *Named material and more detailed description of range of properties, for example*: The aircraft window could incorporate electrochromic glass. A burst of electricity is required for changing its opacity, but once the change has been made, no electricity is needed for maintaining the particular shade which has been reached. **3** *Named material and fully detailed descriptions of range of properties, for example*: The aircraft window could incorporate electrochromic glass. A burst of electricity is required for changing its opacity, but once the change has been made, no electricity is needed for maintaining the particular shade which has been reached. It works by passing low-voltage electrical charges across a microscopically thin coating on the glass surface. **4**			

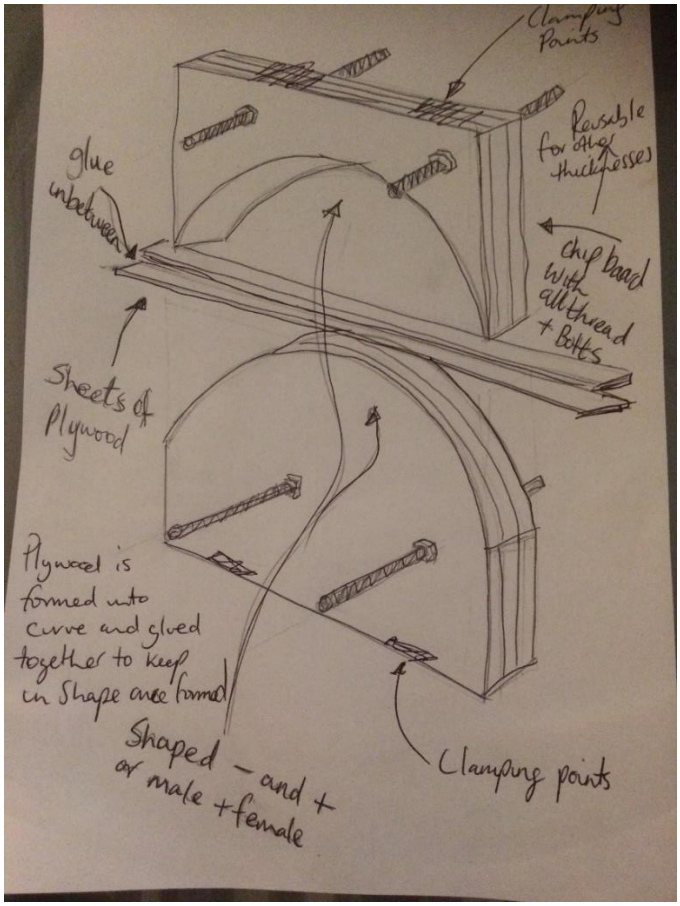
(c)	**Aluminium drinks can** State an appropriate smart material that has been incorporated onto the aluminium drinks can and describe properties that make it suitable.		✓	4
	*Answers that indicate an understanding of an appropriate smart material should be awarded up to **4** marks based on:* Smart Material – Thermochromic inks Properties to include: • Thermochromic inks are special effects inks which change colour if exposed to different temperatures. • They are temperature-sensitive materials and change colour with heat, whether from colourless to coloured, from coloured to colourless, or from one colour to another colour. • They can come in a range of colours. • They come in two forms, liquid crystals and leuco dyes. • Identifies if the drink is cold or hot for the consumer. **Guidance to markers** *Incorrect/no answer* *Identification of smart material, for example*: Thermochromic inks. *Named material and description of one property, for example*: The drinks can could incorporate Thermochromic inks which can change colour with different temperatures. *Named material and more detailed description of range of properties, for example*: The drinks can could incorporate Thermochromic inks which can change colour with different temperatures. The inks can come in a range of colours and this is suitable for the example drinks can as it can respond to temperature to show when the drink is cold. *Named material and fully detailed descriptions of range of properties, for example*: The drinks can could incorporate Thermochromic inks which can change colour with different temperatures. The inks can come in a range of colours and this is suitable for the example drinks can as it can respond to temperature to show when the drink is cold. The thermochromic inks can come in two forms, liquid crystals or leuco dyes.			**0** **1** **2** **3** **4**
			Total	**12**

Question 4

The neck of the lamp below has been manufactured using the process of laminating.		AO3	AO4	Mark
(a)	Using notes and sketches, explain the process of laminating to achieve the curved neck of the lamp.		✓	8

*Answers that explain the process of laminating should be awarded up to **8** marks based on:*

- Several thin pieces of wood layered together and clamped to a former/mould.
- Glues like rigid polyurethane or resin-based adhesives are used between the wooden layers.
- Good quality PVA and crosslinking PVA also suitable adhesives.
- Not only do these glues hold their form, but they also prevent the layers of the lamination from slipping and losing their form over time.
- The former will need clamping areas to ensure plywood is held in shape when drying.
- Possibility of using a vacuum bag press to mould around a former.



	Guidance to markers *Incorrect/no answer*	**0**
	Candidate has a simplistic knowledge. *The use of terminology and technical language is basic.* *Brief description of the laminating process; little understanding evident; basic sketches.*	**1 – 2**
	Candidate has some basic understanding of the issues associated with the question. *The use of terminology and technical language is variable.* *Some detail, descriptions of the laminating process with clear sketches.*	**3 – 4**
	The candidate has clear understanding of the issues associated with the question. *The use of terminology and technical language is mostly accurate.* *More detailed explanation of the laminating process with more detailed knowledge and understanding evident including reference to a former design; appropriate detailed sketches included.*	**5 – 6**
	The candidate demonstrates very clear understanding of the issues associated with the question. *Uses correct terminology and technical language.* *Full and detailed explanations of the laminating process with full detailed knowledge and understanding evident including a relevant former design with highly relevant sketches included.*	**7 - 8**

(b)	The lamp has been finished using beeswax. Explain the process of preparing the surface and applying the beeswax finish.		✓	4

*Answers that indicate an understanding of surface preparation and application should be awarded up to **4** marks based on:*

- Preparing surface using different grit abrasive papers to smooth surface first. Explanation of different grits from low (coarser) to high (finer)
- Removing all dust and dirt using a brush and cloth.
- Use of a tack rag to remove all dust after rubbing down.
- Applying a first coat of beeswax using clean cloth and leaving for 10-15 minutes.
- Buffing off the first coat and repeating process.
- Applying wax in a circular motion to fill the grain in early stages.
- Applying the wax with the grain for better finish.
- Heating the wax to a liquid and dipping.

Guidance to markers

Incorrect/no answer	**0**
Some description of surface preparation, for example: *The wood would need to be prepared using different grit abrasive papers.*	**1**
Some description of surface preparation and application of beeswax, for example: *The wood would need to be prepared using different grit abrasive papers. Following the preparation, the beeswax would be applied using a clean cloth and left for 5-10minutes before buffing off.*	**2**
Explanation of surface preparation and application of beeswax, for example: *The wood would need to be prepared using different grit abrasive papers. Starting with a lower grit and finishing with a higher grit for a better finish. Following the preparation, the beeswax would be applied using a clean cloth and left for 5-10minutes before buffing off.*	**3**
Full explanation of surface preparation and application of beeswax, for example: *The wood would need to be prepared using different grit abrasive papers. Starting with a lower grit and finishing with a higher grit for a better finish. Following the preparation, the beeswax would be applied using a clean cloth and in the grain direction for a better result. The wax will be left for 5-10 minutes before buffing off and the process repeated for better protection.*	**4**

Total	**12**

Question 5

The metal board game token below has been manufactured using die casting.		AO3	AO4	Mark
(a)	Explain **one** reason why die casting is a suitable manufacturing process.		✓	2

*Answers that indicate an understanding of reasons for die casting should be awarded up to **2** marks based on:*

Explanations could include:

- Quick mass production of product.
- Economical method of casting this type of product.
- Dimension accuracy and detail can be achieved.
- Better strength compared to polymer manufacturing techniques.
- Different self-finishes can be achieved.
- Much finer detail and finish achieved compared to sand casting.
- Finishing costs are lower due to quality of casting.
- Allows for the token to be made in one piece.

Guidance to markers

Incorrect/no answer	**0**
Brief description of one reason, for example: *Die casting is suitable due to the quick production which can achieve high volumes of the token.*	**1**
Full explanation of one reason, for example: *Die casting is suitable due to the quick production which can achieve high volumes of the token. This is due to the little or no machining required, and thousands of identical castings can be produced before additional tooling is required.*	**2**

(b)	Name an appropriate metal and explain **one** key property that makes it suitable for the board game token.		✓	3

*Answers that indicate an understanding of reasons for choice of material should be awarded up to **3** marks based on:*

Appropriate materials:

- Pewter
- Zinc
- Magnesium
- Brass
- Aluminium alloys
- Copper
- Tin-based alloys

Properties to include:

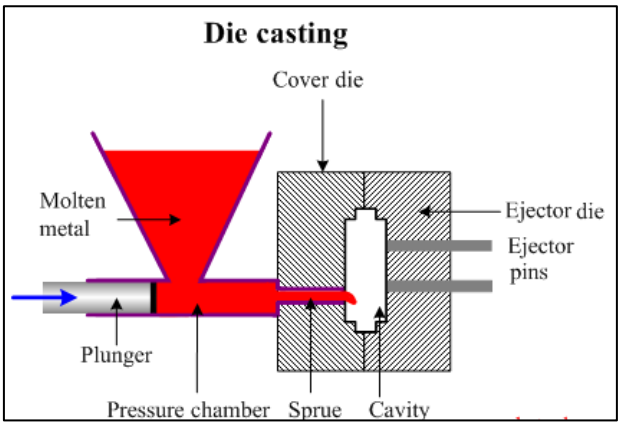
- Lower melting points.
- Better impact strengths compared to polymers.
- Easier to be polished and finished.
- Fluidity of the metal.
- Lightweight properties.

Guidance to markers

Incorrect/no answer	**0**
Identification of a suitable material, for example: *Pewter could be used for the boardgame token.*	**1**
Identification of a suitable material and a brief description of a property, for example: *Pewter could be used for the boardgame token because of its low melting temperature.*	**2**
Identification of a suitable material and an explanation of a property, for example: *Pewter could be used for the boardgame token because of its low melting temperature, however there is still better impact strength compared to polymers once moulded.*	**3**

(c)	Using notes and sketches, explain the process of die casting the board game token.		✓	8

*Answers that indicate an understanding of die casting process should be awarded up to **8** marks based on:*



Guidance to markers

Incorrect/no answer	**0**
A basic method explained with basic sketches, lacking detail to show understanding of the process.	**1-2**
A clear method explained with clear annotated sketches. Main details identified to show understanding of the process.	**3-4**
A detailed method explained with detailed annotated sketches. Most key details identified to show a clear understanding of the process.	**4-6**
A fully explained method with very detailed annotated sketches. All key details identified to show a full understanding of the process.	**6-8**

Candidates should make reference to the board token.

Award credit for casting processes such as pewter casting in band 2 maximum.

	Total	**13**

Question 6

The razors below have been subject to incremental improvements over time.		AO3	AO4	Mark
(a)	Discuss how the razors have benefited from the incremental changes and the impact this has had on the user.		✓	6

*Answers that indicate an understanding of incremental changes should be awarded up to **6** marks based on:*

- Better safety of product due to improved safety designs of product.
- Better grip due to different materials used on the handles.
- Better performance due to multiple blades.
- Better performance due to pivot points that follow contour of body.
- Consumer benefits of affordability due to mass production over the years.
- Ergonomic improvements.
- Combination of different materials due to more advanced manufacturing techniques.
- More versatile to perform a number of different hair related procedures.

Guidance to markers

Incorrect/no answer	**0**
Candidate has a simplistic knowledge. *A basic understanding of key benefits of incremental changes to the consumer.*	**1-2**
Candidate has some basic understanding of the issues associated with the question. *A good understanding of key benefits of incremental changes to the consumer with clear explanations of at least 2 benefits.*	**3-4**
The candidate has clear understanding of the issues associated with the question. *A full understanding of key benefits of incremental changes to the consumer with full clear explanations of at least 3 benefits.*	**5-6**

(b)	Throughout the application of incremental changes, the razor manufacturer considered the 'price' as part of the 4 Ps of marketing. Explain the impact of effective pricing on a new razor product entering the market.		✓	4

*Answers that indicate an understanding of the impact of effective pricing should be awarded up to **4** marks based on:*

- Marketers must link the price to the product's real and perceived value, which can consider the reflection of supply costs.
- Consideration of seasonal discounts.
- Consideration of competitors' prices.
- Raising the price to make a product seem more like a luxury or lower the price so more consumers can try the product.
- Need to determine when and if discounting is appropriate. A discount can sometimes draw in more customers.
- Another consideration is to introduce offers such as buy one get one free.
- Razors sold relatively cheaply to begin and then manufacturer would make more money from the packs of blades sold to replace the one blade that would have been with the original.
- Reference to where it is sold. High end retailer compared to supermarket/discount stores.

Guidance to markers

Incorrect/no answer	**0**
Some description of impact of pricing, for example: Marketers must link the price to the product's real and perceived value this can consider the reflection of supply costs.	**2**
Brief explanation of impact of pricing, for example: Marketers must link the price to the product's real and perceived value this can consider the reflection of supply costs. It is important that the manufacturer would consider the competitors pricing to ensure they do not over or under price.	**2**
Detailed explanations of impact of pricing, for example: Marketers must link the price to the product's real and perceived value this can consider the reflection of supply costs. It is important that the manufacturer would consider the competitors pricing to ensure they do not over or under price. In some cases, you can raise the price to make a product seem more like a luxury or lower the price so more consumers can try the product.	**3**
Full detailed explanations of impact of pricing, for example: Marketers must link the price to the product's real and perceived value this can consider the reflection of supply costs. It is important that the manufacturer would consider the competitors pricing to ensure they do not over or under price. In some cases, you can raise the price to make a product seem more like a luxury or lower the price so more consumers can try the product. Another consideration is to introduce offers such as buy one get one free to attract more sales.	**4**

Total	**10**

Question 7

A coffee shop is looking to improve its environmental impact and rebrand their coffee cups.		AO3	AO4	Mark
	Discuss the ecological footprint of the disposable polystyrene cup in comparison to the reusable bamboo cup.		✓	8
	*Answers that indicate an understanding of ecological footprint should be awarded up to **8** marks based on:* • Reusable cups have a longer lifespan, so their overall disposal impact is much lower than single use cups. • Most reusable cups can be recycled. Bamboo is less of a threat to the natural environment because they will break down over time and do not contain synthetic chemicals, unlike polystyrene which does not biodegrade. • Disposal of single use cups poses other threats such as the cost of waste collection and the accumulation of these products in our oceans, when they are not taken to the landfill or incinerated. • While it takes more energy to produce reusable cups, because they have a longer lifespan their overall environmental impact is much less than disposable cups. • Although the impact of the production of single use cups is lower than reusables, the impact of their use over time and final disposal is much higher. • Reusable cup can be taken to shops to be filled up reducing the need for disposable cups. • Bamboo is a sustainable crop; they can be grown without pesticides and grow incredibly fast. Bamboo is a plant product therefore it stores carbon and will biodegrade. • Bamboo is a plant product and therefore can be harvested over and over again because as a stem is cut, the plant will grow new stems to replace it. • Referencing to circular economy in relation to the 2 products.			

	Guidance to markers *Incorrect/no answer* *Candidate has a simplistic knowledge.* *The use of terminology and technical language is basic.* *Brief description of one to two factors of the ecological footprint; little understanding evident; basic examples.* *Candidate has some basic understanding of the issues associated with the question.* *The use of terminology and technical language is variable.* *Some discussion of three to four factors of the ecological footprint with some explanation and examples.* *The candidate has clear understanding of the issues associated with the question.* *The use of terminology and technical language is mostly accurate.* *More detailed discussion of three to four of the ecological footprint factors, with more detailed knowledge and understanding evident; appropriate comparisons included.* *The candidate demonstrates very clear understanding of the issues associated with the question.* *Uses correct terminology and technical language.* *Full and detailed discussion of four factors of the ecological footprint with full and detailed explanation with highly relevant comparisons included.*	**0** **1 – 2** **3 – 4** **5 – 6** **7 - 8**
	Total	**8**

Question 8

Mass production is a manufacturing system that began in the late 1910s and is still utilised today.		AO3	AO4	Mark
(a)	Explain the meaning of the term 'mass production'.	✓		2
	*Answers that indicate an understanding of mass production should be awarded up to **2** marks based on:* • Automated process for large volume production of products. • Standardised parts or large production of similar products produced on a large-scale using assembly lines. **Guidance to markers** *Incorrect/no answer* **0** *Brief description of mass production, for example*: **1** Mass production is the production of products on a large scale, producing large volumes of similar products. *Full explanation of mass production, for example*: **2** Mass production or continuous production is an automated process for large volume production of products. Standardised parts or large production of similar products are produced on a large-scale using assembly lines.			
(b)	Evaluate how mass production has contributed to the historical development of cars, along with the social and economic impacts of mass production.	✓		10
	*Answers that indicate an understanding of mass production and socioeconomic impacts should be awarded up to **10** marks based on:* • Henry Ford pioneered mass production techniques in the car industry. His aim was to produce affordable cars for the public by using new technology. • This method had two main advantages: it was quick and did not require large numbers of highly skilled workers. • The methods made major contributions to the large growth in manufacturing productivity of cars over the years. • Pioneered new techniques of production which other industries copied. • Increase use of robotics, CAD/CAM and AI. • Use of new technology and automation of assembly lines have improved consistency, cost, and car development. • The use of modern methods of mass production has brought such improvements in the cost, quality, quantity, and variety of goods available. Social and economic **impacts** • It led to the expansion of cities and the development of towns and road networks. • It encouraged the construction industry - petrol stations were built, as were hotels and restaurants. • The development of hire purchase schemes and expansion of the stock market. • With the introduction of mass production into other industries some items became less scarce and easier to manufacture on a larger scale. • Big manufacturers, such as Henry Ford, were so rich and famous they were able to influence government policy. • Many of the rich businessmen became philanthropists, Henry Ford built a hospital and a museum and gave millions to schools, colleges and orphanages.			

	Guidance to markers *Incorrect/no answer* *Candidate has a simplistic knowledge.* *The use of terminology and technical language is basic.* *Brief description of the contribution of mass production; basic or no example.* *Candidate has some basic understanding of the issues associated with the question.* *The use of terminology and technical language is variable.* *Some detail with some understanding of the contribution of mass production which have been briefly explained.* *The candidate has a clear understanding of the issues associated with the question.* *The use of terminology and technical language is mostly accurate.* *More detailed evaluation of the contribution of mass production with clear knowledge and understanding evident; appropriate examples included to aid evaluation.* *Understanding of the socioeconomic effects of mass production which have been briefly explained.* *The candidate has a very clear understanding of the issues associated with the question.* *The use of terminology and technical language is accurate.* *More detailed evaluation of the historical contribution of mass production with full knowledge and understanding evident; appropriate examples included to aid evaluation.* *Detailed understanding of the socioeconomic effects of mass production which have been clearly explained.* *The candidate demonstrates an excellent understanding of the issues associated with the question.* *Uses correct terminology and technical language including types of materials and processes.* *Full detailed evaluation of the historical contribution of mass production with full knowledge and understanding evident; appropriate examples included to aid evaluation with comparisons made to advantages and disadvantages.* *Full detailed understanding of the socioeconomic effects of mass production which have been fully evaluated.*	**0** **1 – 2** **3 – 4** **5 – 6** **7 – 8** **9 - 10**
	Total	**12**

Question 9

The Memphis design movement founded in the 1980s influenced the design of the products shown below.		AO3	AO4	Mark
	Discuss how the Memphis design movement challenged the perception of good design.		✓	8
	*Answers that indicate an understanding of Memphis design movement should be awarded up to **8** marks based on:* • The Memphis design movement was a group of Italian designers, architects, and writers during the 1980s. • The Memphis design group produced many memorable pieces of colourful, bright, and innovative furniture, lighting, and textiles. • Laminate and Terrazzo materials, which were usually found on floors, were incorporated into tables and lamps. • Bright, multi-coloured objects with a rejection of typical shapes. Often, instead of chair legs being rectangular, they'd be circles or triangles. • The movement's overriding aim was to develop a new, mostly radical, approach to design. • Inspiration was drawn from such movements as Art Deco and Pop Art. • The Memphis group's work continues to split opinions where some people are fans and others are not. • At the time, objects were usually designed to be functional, not decorative. Memphis changed this with a more creative approach to design, where they poked fun at everyday objects by designing them in a way that was unusual • the movement was a counter argument against the rigidity of modern and minimalism. Instead, Memphis Designers wanted to bring out the 'radical, funny and outrageous' • Candidates need to analyse the images provided to discuss shapes, colours and function in relation to products. Not just explain the history of Memphis.			

	Guidance to markers Incorrect/no answer Candidate has a simplistic knowledge. The use of terminology and technical language is basic. Brief description of one to two factors of Memphis design movement; little understanding of how Memphis challenged the perception of good design evident; basic examples. Candidate has some basic understanding of the issues associated with the question. The use of terminology and technical language is variable. Some detail discussion of three to four factors of how Memphis design movement challenged the perception of good design with some explanation and examples. The candidate has clear understanding of the issues associated with the question. The use of terminology and technical language is mostly accurate. More detailed discussion of three to four factors of how Memphis design movement challenged the perception of good design with more detailed knowledge and understanding evident; appropriate examples included. The candidate demonstrates very clear understanding of the issues associated with the question. Uses correct terminology and technical language. Full and detailed discussion of four factors of how Memphis design movement challenged the perception of good design with full and detailed explanation with highly relevant exemplars included.	**0** **1 – 2** **3 - 4** **5 – 6** **7 - 8**
	Total	**8**

Question 10

Many global companies use the 'Six Sigma' project management tool. Analyse how the Six Sigma project management tool benefits both the employer and employees. Marks will be awarded for the content of the answer and the quality of written communication.	**AO3**	**AO4**	**Mark**
	✓		10

*Candidates should demonstrate knowledge and understanding and apply it to the 'Six Sigma' project management tool to be awarded up to **10** marks based on:*

Analysing the stages: Define, Measure, Analyse, Improve, and Control.

Employer benefits:

- Six Sigma uses measurement tools that assist businesses in improving weaknesses and building on their strengths.
- Strengthen skills of employees to enable better skilled workforce.
- Increased customer satisfaction.
- Improve Performing Workforce, Six Sigma training can show employees how best to utilise resources. This decreases the cost of materials and operation.
- Attract Higher Quality Candidates applying for jobs.
- Increase Shareholder Confidence.
- Improve Business Partnerships.

Employee benefits:

- Better job opportunities and improved salary due to the certification applying in electronics, aerospace, banking and financial services, IT, telecom, HR, marketing, and many more industries.
- Prepares employees for a leadership role.
- Involves hands-on work through business projects that will give experience with implementation of principles to real-life situations.

In order to be awarded higher marks candidates need to address issues relating to employee and employers.

	Guidance to markers *Incorrect / no answer* *Limited understanding and application of knowledge of six sigma.* *There is limited evidence of relevant examples.* *Quality of Written Communication is limited, presenting material with limited coherence, many errors of grammar, punctuation and spelling.* *Basic understanding and application of knowledge of benefits of six sigma.* *There is a line of reasoning which is generally coherent and relevant.* *Quality of Written Communication is basic, presenting occasional appropriate material with some coherence, some errors of grammar, punctuation and spelling.* *Good understanding and application of knowledge of six sigma and how it benefits both the employee and employer.* *There is a sustained line of reasoning which is generally coherent, relevant and substantiated.* *Quality of Written Communication is good, presenting mainly appropriate material in a coherent manner, few errors of grammar, punctuation and spelling.* *Very good understanding and application of knowledge of six sigma and how it benefits both the employee and employer.* *Answer is explained and analysed in detail.* *There is a sustained line of reasoning which is coherent, relevant and substantiated.* *Quality of Written Communication is very good, presenting mainly appropriate material in a coherent manner, few errors of grammar, punctuation and spelling.* *Excellent understanding and application of knowledge of six sigma and how it benefits both the employee and employer.* *Answer is explained and analysed in excellent detail giving examples where needed.* *There is a sustained line of reasoning which is coherent, relevant and substantiated.* *Quality of Written Communication is excellent, presenting wholly appropriate material in a coherent and logical manner, hardly any errors of grammar, punctuation and spelling.*	**0** **1 – 2** **3-4** **5-6** **7-8** **9-10**
	Total	**10**