GCE A LEVEL MARKING SCHEME

SUMMER 2024

A LEVEL
DESIGN AND TECHNOLOGY – PRODUCT DESIGN
A602U10-1

© WJEC CBAC Ltd.

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.

© WJEC CBAC Ltd.

GCE A LEVEL DESIGN AND TECHNOLOGY

COMPONENT 1: PRODUCT DESIGN

SUMMER 2024 MARK SCHEME

Question 1

A logo for Smith's Electronics of Winchester is shown below.

(a) Explain why the logo for 'Smith's Electronics of Winchester' was refused a Trademark [4]

(b) Explain how Copyright would protect 'Smith's Electronics of Winchester' from unauthorised companies using their logo even if a Trademark does not apply. [4]

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

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

- Trademarks are not permitted to describe the goods or services they provide within a given sector [1], other companies within the sector would need to make use of the word 'electronics' too [1],
- It can be considered misleading, describing the brand as the 'best' [1], consumers could be misled into thinking that this was measured in a quantifiable way [1]
- The logo contains a place name which cannot be trademarked [1], other companies within the area would also need to make use of their physical location so that consumers can locate them [1],
- The symbol (image of a plug) is too commonly used in the sector and is therefore non-distinctive [1], trademarks cannot be granted for signs or symbols that are in common use [1]

Credit any other appropriate response.

© WJEC CBAC Ltd.

1 (b)							2	2			**4**

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

- Copyright would apply as it is an automatic right for original works [1] which belongs to the owner and stops others from copying and redistributing protected work without authorisation [1],
- It stops others from adapting the logo then using it for their own purposes [1], so that consumers do not get confused and make associations between two unrelated brands [1],
- Copyright can be licensed out or sold so that the originator can gain financial reward for their work [1], Smiths Electronics of Winchester could licence their logo out to subsidiaries or franchises for financial gain [1],
- Copyright lasts for the life of the creator plus 70 years and can be passed on in a will [1], protecting the originator for their lifetime and beyond without the need to extend protection [1].

Credit any other appropriate response.

© WJEC CBAC Ltd.

Question 2

A desk lamp designed by a student is shown below. It has a lampshade made from a single copper sheet with a hole cut out of each side. Each of the 4 sides is a trapezium which has been folded from a net (surface development).

(a) Explain how to cut out and fold the copper sheet to create a 3-dimensional form such as the lampshade shown. [4]

(b) The manufacturer has decided to make the lampshade in two sizes as shown in diagrams A and B above.

(i) Calculate the ratio of lampshade A : B
Show all calculations [1]

(ii) Calculate the diameter of the circle in original lampshade A.
Show all calculations [1]

(iii) Calculate the height of the scaled-up drawing lampshade B.
Show all calculations [1]

(iv) Calculate the surface area of one side of the original lampshade A.
Show all calculations [5]

(c) Discuss the suitability of copper for use as a lampshade. [4]

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

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

- Use a template and a scribe to mark out the surface development [1]
- Cut the shape using snips and file smooth to remove burrs [1]
- insert sheet into the metal folding bars [1]
- Pull raising bar to 90 degrees [1]
- Repeat process for the last two folds to make the 3-dimentional shape [1]
- Open edge can be soldered together [1]

Credit answers that refer to cutting out the surface development with CAM equipment such as a laser cutter, cnc mill, waterjet cutter.

Apply best fit mark by assessing process and diagram.

Credit any other appropriate response.

© WJEC CBAC Ltd.

2 (b) (i)		Y									**1**

Candidates should demonstrate knowledge and understanding and be awarded up to 1 mark.

Ratio can be calculated from relationship between sizes of the top width of the trapezium.
100:150

Therefore ratio is 2:3 **(1 mark)**

Do not penalise for errors carried forward. Continue to award marks if you can clearly see the mathematical method used by the candidate.
Accept any other mathematical method to achieve the final answer.

2 (b) (ii)		Y									**1**

Candidates should demonstrate understanding and be awarded up to 1 mark based on appropriate mathematical calculations, such as:

Ratio can be calculated from relationship between sizes of the top width of the trapezium.
100:150

Therefore:
x = 100/150 * 75 = 50mm **(1 mark)**

OR

X = 2/3 * 75 = 50mm

Do not penalise for errors carried forward. Continue to award marks if you can clearly see the mathematical method used by the candidate.
Accept any other mathematical method to achieve the final answer.

2 (b) (iii)		Y									**1**

Candidates should demonstrate understanding and be awarded up to 1 mark based on appropriate mathematical calculations, such as:

Height = 3/2 * 120 = 180mm **(1 mark)**

Do not penalise for errors carried forward. Continue to award marks if you can clearly see the mathematical method used by the candidate.
Accept any other mathematical method to achieve the final answer.

© WJEC CBAC Ltd.

2 (b) (iv)		Y									5

Candidates should demonstrate understanding and be awarded up to 5 marks based on appropriate mathematical calculations, such as:

Calculate area of a trapezium:
Area of trapezium = $\frac{\text{sum of parallel sides * perpendicular height}}{2}$

Sum of parallel sides = 100 + 150 = 250 **(1 mark)**
Multiply by perpendicular height = 250 * 120 /2 = 15,000mm^2 **(1 mark)**

Calculate area of a circle:
$\text{Area of a circle} = \pi r^2$
$3.14 * 25^2$ **(1 mark)**

= 1963.5 mm^2 (1dp) **(1 mark)**

Subtract area of circle from area of trapezium:
15,000 – 1963.5 = 13,036.5mm^2 **(1 mark)**

Accept answers which are correct based on number of decimal places used.

Do not penalise for errors carried forward. Continue to award marks if you can clearly see the mathematical method used by the candidate.
Accept any other mathematical method to achieve the final answer.

2 (c)							3	1			4

Candidates should demonstrate knowledge and understanding and be awarded up to 4 marks.

Candidate must make reference to the suitability of copper for use as a lampshade. Do not award marks for a list of properties outside of the context of the lampshade.

- Copper is an extremely good conductor of heat [1] which means the lampshade might get too hot if traditional filament bulbs are used [1],
- Copper is malleable which makes [1] it easy to bend into shape to create the design from a net (surface development) [1],
- The copper can be polished to a high-sheen [1] which will be desirable to the target market [1], though the copper will tarnish (patina) over time and will require regular polishing by the user [1],

Credit any other appropriate response.

© WJEC CBAC Ltd.

Question 3

(a) Describe the mechanical and physical properties of silicone rubber that make it suitable for use as baking moulds. [4]

(b) Explain how the use of Polytetrafluorethane (PTFE) has contributed to the design of cookware, such as the frying pan shown. [4]

Q 3	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
3 (a)	x					4					**4**

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

- Silicone is flexible [1] so that it can be peeled away from cakes/bread after baking and will return to its shape afterwards [1],
- It doesn't melt it high temperatures [1] so it suitable for oven baking at high temperatures (e.g. 260 degrees for domestic ovens) [1],
- It is food safe and non-toxic [1] so will not contaminate food items causing sickness [1],
- It is durable [1] making it suitable for repetitive regular use in a range of environments (e.g. oven, dishwasher, sink) [1],
- Cools quickly once the heat source has been removed [1] which stops cakes/bread from continuing to cook after being removed from the oven [1].

Credit any other appropriate response.

3 (b)	x								4		**4**

Candidates should demonstrate knowledge of design and make principles and can be awarded up to 4 marks.

- Exceptional chemical resistance [1], this makes the pans and cookware easy and efficient to clean [1],
- Strong anti-adhesion properties (non-stick) [1], this stops food sticking to the pans during cooking [1],
- It is very flexible [1] which means as a coating it can be applied to a range of surfaces with different shapes and contours [1],
- Good fatigue resistance [1], making the products long lasting even when in regular use [1].
- Resistant to high temperatures [1], this means it will not melt during the cooking process [1].

Credit any other appropriate response.

© WJEC CBAC Ltd.

Question 4

Market research is an important part of the design process when developing innovative products.

(a) Discuss the role a focus group plays in the development of new products. [4]

(b) The pie chart shows the results of a survey of 180 people when asked the question 'what is the most motivating factor in your decision to purchase a new electric toothbrush?'
Calculate how many more people chose 'reliability' over 'ease of use'. [3]

(c) Calculate the number of people who would have to change their option from 'Reliability' to 'Brand name' to make the categories equal [4]

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

Candidates should demonstrate knowledge and be awarded up to 4 marks.

- Hear consumer feedback on design ideas and concepts in their own words and voices [1], though some may only say what they think the brand wants to hear or be swayed by others in the group [1],
- Uncover ideas and issues that initially may not have been considered – but are important to the consumer [1], giving fresh thought on a concept 'from cold' [1],
- Have the flexibility to dive deeper into issues that come up during the discussion [1], unlike surveys which leave little opportunity for this [1],
- Opportunity for consumers to handle early concepts [1], which might uncover previously missed flaws in a design [1].

Credit any other appropriate response.

4 (b)		Y									**3**

Candidates should demonstrate understanding and be awarded up to 3 marks based on appropriate mathematical calculations, such as:

Number of people who chose 'reliability'
30/100 * 180 = 54 **(1 mark)**

Number of people who chose 'ease of use'
5/180 * 100 = 9 **(1 mark)**

54 – 9 = 45 more people chose reliability over ease of use **(1 mark)**

Do not penalise for errors carried forward. Continue to award marks if you can clearly see the mathematical method used by the candidate.
Accept any other mathematical method to achieve the final answer.

© WJEC CBAC Ltd.

4 (c)		Y									**4**

Candidates should demonstrate understanding and be awarded up to 4 marks based on appropriate mathematical calculations, such as:

Percentage of people choosing 'Brand name' = 10%
Percentage of people choosing 'Reliability' = 30% **(1 mark)**

Average of the two totals: **(1 mark)**
10 + 30 / 2 = 20%

Therefore 10% of people need to move from Reliability to Brand name **(1 mark)**

10% of 180 = 18 **(1 mark)**

Do not penalise for errors carried forward. Continue to award marks if you can clearly see the mathematical method used by the candidate.
Accept any other mathematical method to achieve the final answer.

© WJEC CBAC Ltd.

Question 5

Laminated timber products such as those below are often used in contemporary furniture design.

(a) Using notes and sketches explain how you would construct a laminated timber product such as those shown. [5]

(b) Explain the advantages of laminating timber to make contemporary furniture. [5]

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

Candidates should demonstrate knowledge and be awarded up to 5 marks.

The candidate may describe either of the methods below:
Vacuum bag

- A mould is cut from a material such as blue foam or mdf [1],
- Vacuum bag is set up with one end sealed, it is checked to make sure there are no holes and that it is big enough for the work piece, [1],
- Layers of flexi-ply or similar material are cut to size and a creep resistant glue is applied evenly to each contacting surface [1],
- The layers of flexi-ply, veneers and mould are placed inside the vacuum bag which is then sealed [1],
- A vacuum pump removes the air forming a vacuum which clamps the flexi ply/veneer to the mould [1],
- The glue is left to cure while the pump continues to run [1],
- When cured, the flexi ply/veneer are removed from the bag, trimmed and finished [1].

Or

Mould and clamps (candidate may describe a one- or two-part mould),

- A mould is cut from a material such as MDF.[1],
- Dry clamp (dry run) is performed to ensure set up is correct [1],
- Layers of flexi-ply or similar material are cut to size and a creep resistant glue is applied evenly to each contacting surface [1],
- The flexi ply/veneer is placed up against the mould and held in place with clamps or cramps until the glue cures [1],
- When cured, the flexi ply/veneer are removed from the mould, trimmed and finished [1].

Or

- Steam bending
- Soak the timber for at least 24 hours before bending [1],
- Place the moist wood into a steam box [1],
- Hook up steam generator to the steam box and turn on [1]
- Remove the timber from the steam box using heat proof gloved and secure around mould [1],
- Secure around mould using clamps [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 any other appropriate response.

© WJEC CBAC Ltd.

5 (b)							5				**5**

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

- Laminated timber has increased compressive strength when compared to natural timber [1] this makes it possible to use as structural pieces where longer weight bearing arches are required [1],
- It is possible to make larger products from smaller pieces of timber [1], meaning younger trees can be used [1],
- It is possible to create curved profiles that are not cut from flat substrates [1], meaning less waste [1],
- As a composite material, it has good strength to weight ratio [1], the effects of any natural defects such as knots are reduced as layers either side would not share the defect [1],
- It is less prone to cracking and warping than natural timber [1] making it suitable for use in a wide range of applications [1].

Credit any other appropriate response.

© WJEC CBAC Ltd.

Question 6

A new 3D printer is to be sold in the marketplace, discuss strategies that could be used to determine the retail price. [5]

Q 6	Science	Maths		AO3		AO4					Total
				2a	2b	1a	1b	1c	2a	2b	
6										5	**5**

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

Responses can include:

A range of strategies can be used to set the price of a new product.
Competitive pricing is when the price is based on what the competitors are charging [1], this is often used by new businesses [1], Price skimming is setting the price as high as possible to start with to skim off the top of the market [1] then gradually start lowering them over time to reach everyone else [1]. Penetration pricing is setting the price very low when the product is launched in order to gain high volume of sales and big market share [1], however, a greater volume of sales will be required to make the product viable [1] Dynamic pricing is used to constantly change prices in response to competitor prices or offers [1], this requires constant monitoring and can put off some buyers who will try to hold off for a better deal [1]. Cost of materials and labour also needs to be considered as part of the pricing strategy [1].

Credit any other appropriate response.

© WJEC CBAC Ltd.

Question 7

Computer Aided Design (CAD) and physical modelling are used extensively throughout the design process to help develop products such as the electric shaver shown below.

(a) Evaluate how CAD can be used to help determine material choices at the design phase before physical prototypes are made. [6]

(b) Analyse the benefits physical models have on the design process for a new product such as an electric shaver. [6]

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

Indicative content:

- CAD can use used to visualise aesthetic qualities of a variety of materials so that decisions can be based on the material in context and mapped to the shape/form of the intended design. This gives the client a full understanding of the design intention,
- Material limits and properties can be tested virtually to compare mechanical properties such as toughness or hardness without the need for physical models,
- As different materials have different properties, the size, weight and shape of parts can vary depending on material choices,
- CAD based finite element modelling can predict how a material will react to vibration, fluid flow, heat transfer etc. all of which affect material choice.

Credit any other appropriate response.

Band	Marks	AO3 2b	Marks	AO4 1c
2	**3-4**	Good evaluation of the purpose of the CAD. A sound discussion which appraises and/or makes judgements about the benefits of CAD development. Generally well-considered, relevant issues used as a context for the discussion	**2**	Applies a sound knowledge and understanding of technical principles relating to the use of CAD
		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 purpose of CAD. Little evidence of appraising or making judgements about benefits of CAD development	**1**	Applies a basic knowledge and understanding of technical principles relating to the use of CAD
		There is limited evidence of relevant examples or structure		
	0	No response or work that is worthy of a mark		

© WJEC CBAC Ltd.

7 (b)				4						2	**6**

Candidates should show clear evidence of *appraisal* and/or *making judgements* and *applying* this to technical principles to be awarded up to 6 marks

Indicative content:

- Physical models allow for actual interaction with the design idea so that factors such as ergonomics can be fully evaluated and analysed,
- Working on a physical model rather than a CAD model can give the designer a better understanding of the interaction between the user and product so that flaws can be found and improvements made,
- Perception of scale and weight distribution can be different when viewing/interacting with physical models,
- Physical models allow a design to be tested by a range of users,
- Physical models can be used for body storming exercised to simulate the product in use and misuse,
- Solutions can be physically modelled quickly and easily, where sometimes CAD equivalents can be difficult to draw. Solutions are not bound by the designers capability in CAD.

Credit any other appropriate response.

Band	Marks	AO3 2a	Marks	AO4 2c
2	**3-4**	Good analysis of the impact physical models has on the design process. A generally sound discussion, which deconstructs information and provides adequate connections and reasoning. Generally well-considered discussion.	**2**	Applies a generally sound knowledge and understanding of the impact physical models have on the design process, with generally well-considered factors identified.
		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 impact of physical models has on the design process. Little evidence of deconstructing information and limited connections are made. Few factors are identified.	**1**	Applies a basic knowledge and understanding of physical models.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark.		

© WJEC CBAC Ltd.

Question 8

Explain how high build quality can influence the sale of products such as electric DIY tools. [9]

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

Candidates should provide evidence of logical reasoning or deconstructing information and applying this to be awarded up to 9 marks. The focus should be on analysis of the factors, though candidates are expected to apply knowledge and understanding of designing and making principles in the deconstruction of information and discussion.

Indicative content:

1. When a brand has high build quality it gains a good reputation in the marketplace which affects volume of sales,
2. Good build quality often also means reliability; the product is less likely to fail so it won't need to be replaced (buy cheap, buy twice). When deciding between competitor brands, consumers are likely to place build quality and reliability towards the top of their list,
3. Good build quality can mean that DIY electric tools are safer to use,
4. Good build quality fuels word-of-mouth recommendations which are one of the most powerful ways to promote a product,
5. Build quality can be seen as a product identifier, in some cases consumers would accept fewer product features if the product quality was higher,
6. Good build quality is associated with product robustness; products that are built to a higher quality can often withstand greater forces and misuse before breaking,
7. Higher quality materials to meet or exceed the expectations of the target market
8. Once a brand becomes known for high build quality, they can often command a higher price when they bring new products to market as consumers will assume a similar level of reliability and build quality,
9. Higher build quality can also be reflected in the length of warranty a manufacturer is willing to offer; the longer the warranty, the more confidence consumers will have when purchasing.

Credit any other appropriate response.

© WJEC CBAC Ltd.

Band	Marks	AO3 2a	Marks	AO4 2c
3	5-6	Excellent analysis of how build quality impacts on product sales. A thorough discussion, which deconstructs information and demonstrates logical connections and reasoning throughout. Well-considered discussion relating back to product sales.	3	Applies a thorough knowledge and understanding build quality, with well-considered, broad ranging relevant factors identified.
		There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.		
2	3-4	Good analysis of how build quality impacts on product sales. A generally sound discussion, which deconstructs information and provides adequate connections and reasoning. Generally well-considered discussion relating back to product sales.	2	Applies a generally sound knowledge and understanding of build quality, with generally well-considered factors identified.
		There is a line of reasoning which is generally coherent, mainly relevant and with some evidence and structure.		
1	1-2	Limited analysis of how build quality impacts on product sales. Little evidence of deconstructing information and limited connections are made. Few factors are identified.	1	Applies a basic knowledge and understanding of build quality.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark.		

© WJEC CBAC Ltd.

Question 9

Shape Memory Alloys (SMA) are increasingly being used in the development of new products such as those shown below.

Discuss the advantages and disadvantages of the use of SMAs in the development of new products. [9]

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

Candidates should demonstrate knowledge and understanding of technical principles and designing and making principles and apply this to be awarded up to 9 marks.

Indicative content:
Shape memory alloys (SMA) are materials that have the ability to return to a former shape when subjected to either heat or electrical current (with a low operational voltage).

Advantages include:
- They have super elastic properties
- They have excellent corrosion resistance
- They have good biocompatibility. These properties make it an ideal biological engineering material, especially in orthopaedic surgery and orthodontics
- They have high dampening capacity
- They have a high power to weight ratio
- They are compact and incredibly light
- Large actuation force
- High resistance to wear

Disadvantages Include:
- Complex thermomechanical behaviour
- Complex motion control
- Very expensive
- Can be subject to fatigue which could lead to a crack and eventual product failure
- It is possible that in environments where temperature is not controlled, unintended actuation may occur.

Credit any other appropriate response.

© WJEC CBAC Ltd.

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 use of SMAs. Well-considered, relevant wider issues identified.	**3-4**	Demonstrates and applies a thorough knowledge and understanding of designing and making principles considering the new product theme, drawing upon 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 a generally sound knowledge and understanding of technical principles in the use of SMAs. Generally well-considered, relevant issues identified.	**2**	Demonstrates and applies a generally sound knowledge and understanding of designing and making principles considering the new product theme. 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 use of SMAs. Few issues are identified	**1**	Demonstrates and applies a basic knowledge and understanding of designing and making principles considering the new product theme. Few examples are provided.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark.		

© WJEC CBAC Ltd.

Question 10

There is a growing demand for designers to acknowledge environmental, moral and ethical responsibilities when designing new and innovative products.

Evaluate the impact of environmental, moral and ethical considerations on the development of new innovative products. [12]

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

Candidates should provide evidence of either their appraisal and/or making judgements and applying this to be awarded up to 12 marks.

Indicative content

Materials

- Checking that materials have been sourced responsibly including use of local natural resources
- Use of responsibly managed resources to ensure sustainable use and regrowth (e.g. FSC)
- Making sure the workforce in a safe and fair way and the use of child and slave labour is avoided
- Materials are labelled and marked honestly
- Seek certification for fairtrade certification where possible
- Ensure that unnecessary materials are reduced or removed to reduce environmental impact
- Use of recycled and recyclable materials will reduce environmental impact
- Make sure products are safe and compliant for the user. This includes adherence to external QA standards and checks such as BSI or ISO
- Are users' beliefs taken into account when choosing materials such as use of vegan friendly materials or those that avoid animal products that some groups consider sacred?

Design & Manufacturing

- Are sustainable manufacturing processes lean and efficient and do they make use of renewable energy sources where possible?
- Is renewable energy used to power factories or machinery to reduce environmental impact?
- Is a closed-loop system used where waste material is recovered, recycled and reused to minimise any waste?
- Has the product been designed with integrated fittings to reduce the need for extra components and materials?
- Has the produce been designed with the end-of-life in mind so that the product can either be reused, repurposed or recycled so that it does not contribute to landfill?
- Has the product been designed with planned obsolescence or designed for maintenance in mind?
- Are the products tested on animals?
- Are workers paid a fair wage, and work in safe and fair conditions?

© WJEC CBAC Ltd.

Usability and form
An unusable product is considered a design failure. More specifically the design should help the user accomplish what they want, meet their needs, and be easy and pleasant to use.

- Learnability—How easy is it for first-time users?
- Efficiency—How quickly can users perform tasks?
- Errors—How many errors do users make and how severe are these errors?
- Safety - are control surfaces, information displays, product surfaces easy to access and operate? Or deliberately difficult to operate to prevent the user doing something that will endanger them? Is the product intuitive to use to help prevent misuse?
- Maintenance - is the product fit for purpose and is it easy to maintain?
- Affordability - can the group of users who need to use the product afford to buy it?
- User-centred - has the user group been involved in the development of the design and have their comments been considered in the evolution of the design?

Accessibility
Accessibility should be incorporated in the development process of any product being designed and not as an afterthought. Designers should always consider who might be intentionally or unintentionally left out by the design choices they make. Often, those with disabilities or very old or very young consumers are not considered as part of the design.

Language barriers can also be a consideration. Ideograms are used as a universal language to make instructions clear without the barrier of language.

Candidate can only be awarded marks in the top mark band if environmental, moral AND ethical considerations are evaluated.

Credit any other appropriate response.

© WJEC CBAC Ltd.

Band	Marks	AO3 2b	Marks	AO4 1c
3	5-6	Excellent evaluation of environmental, moral and ethical responsibilities. A thorough discussion, which appraises and/or makes judgements about the effectiveness of local considerations. Well-considered, relevant wider issues used as a context for the discussion.	5-6	Applies a thorough knowledge and understanding of technical principles related to ethical innovative product design. Well-considered, relevant wider issues identified.
		There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured.		
2	3-4	Good evaluation of environmental, moral and ethical responsibilities. A generally sound discussion, which appraises and/or makes judgements about local considerations. Generally well-considered, relevant issues used as a context for the discussion.	3-4	Applies a generally sound knowledge and understanding of technical principles related to ethical innovative product design. Generally well-considered, relevant issues identified.
		There is a line of reasoning which is generally coherent, mainly relevant and with some evidence and structure.		
1	1-2	Limited evaluation of environmental moral and ethical responsibilities. Little evidence of appraising or making judgements about local considerations. Few issues are identified.	1-2	Applies a basic knowledge and understanding of technical principles related to ethical innovative design.
		There is limited evidence of relevant examples or structure.		
	0	No response or work that is worthy of a mark.		

© WJEC CBAC Ltd.