GCSE

WJEC GCSE
Design and Technology

Approved by Qualifications Wales

Sample Assessment Materials

Unit 1: Design and Technology in the 21st Century (Product Design)

Teaching from 2026
For award from 2028



This Qualifications Wales regulated qualification is not available to centres in England.

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Ready for the world.

WJEC would like to thank the students and teachers of Fitzalan High School, Cardiff and Llanwern High School, Newport for their participation in the creation of these covers.

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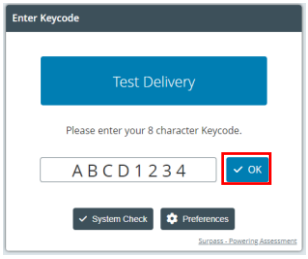
Unit 1: Design and Technology in the 21st Century (Product Design)

Unit 1: Design and Technology in the 21st Century (Product Design), is assessed by Digital Examination. The online Sample Assessment Materials can be accessed here: https://web.download.wjec.co.uk/surpass/packaged-exams/GCSE-DT-Product-Design-Unit1-EN/index.html

Guidance for accessing the online Sample Assessment Materials is detailed in the following steps:

<table>
<tr><td colspan="2">1. Click on the link provided:</td></tr>
<tr><td>2. Click ‘OK’:</td><td>
</td></tr>
<tr><td>3. Click ‘Yes’:</td><td>
</td></tr>
<tr><td>4. Click ‘Start the Test’:</td><td>
</td></tr>
<tr><td>5. To navigate through the assessment, click ‘Back’ or ‘Next’ at the bottom of the screen:</td><td>
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<tr><td colspan="2">6. Once the Sample Assessment Material has been viewed, close the tab or browser.</td></tr>
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MARK SCHEME

Guidance for examiners

Generic marking principles

- Marks awarded are always whole marks (not half marks, or other fractions).
- Answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.
- Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
- Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Positive marking

It should be remembered that candidates are writing under examination conditions and credit should be given for what the candidate writes, rather than adopting the approach of penalising candidates 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.

Mark schemes often list points which may be included in candidates' answers. The list is not exhaustive. The inclusion of *'Credit any other valid response.*' (or similar instruction) within mark schemes allows for the possible variation in candidates' responses. Credit should be given according to the accuracy and relevance of candidates' answers.

Appropriate terminology is reflected in exemplar responses in mark schemes. However, unless there is a specific requirement within a question, candidates may be awarded marks where the answer is accurate but expressed in their own words.

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 points and issues which may be included in candidates' answers. It can be used to assess the quality of the candidate's response. As noted above, indicative content is not intended to be exhaustive and candidates do not have to include all the indicative content to reach the highest level of the mark scheme.

However, to reach the highest level of the mark scheme a candidate must meet the requirements of the highest mark band. Where a response is not creditworthy, that is, it contains nothing of any significance to the mark scheme, or where no response has been provided, no marks should be awarded.

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The marking of banded mark questions should always be positive. This means that, for each candidate's response, marks are accumulated for the demonstration of relevant skills, knowledge and understanding: they are not deducted from a maximum on the basis of errors or omissions.

Examiners should first read and annotate the candidate's answer to pick out 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 candidate'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 most closely matches the work.

Stage 2 – Deciding on the mark

Having determined the appropriate band, deciding on the mark within a band will be made on the basis of a 'best fit' procedure, weaknesses in some areas being compensated for by strengths in others.

Examiners should use the full range of marks available to them. Marking should be positive, rewarding achievement rather that penalising failure or omissions. The awarding of marks must be directly related to the marking criteria, and all responses must be marked according to the banded levels provided for each question.

Standardising material that has already been awarded a mark will be provided during standardising and this should be used as a reference material when assessing work. Examiners are reminded of the need to revisit the standardising material as they apply the mark scheme in order to confirm that the band and the mark allocated is appropriate to the work submitted.

This mark scheme instructs examiners to look for and reward valid alternatives where indicative content is suggested for an answer. This is not a checklist for expected content in an answer, or set out as a 'model answer', as responses must be marked in the banded levels of response provided for each question. Where a candidate provides a response that contains aspects or approaches not included in the indicative content, examiners should use their professional judgement to determine the validity of the response in light of the task and reward as directed by the bands. Candidates are free to choose any approach that is relevant to the set task. Candidates can (and will most likely) incorporate ideas other than those mentioned in the mark scheme.

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Product Design

Question		Answer	AO1	AO2	Total Mark
1.	(a) (i)	Select the correct name from the drop-down menu for each of the Energy Sources pictured.			
		Award **one** mark each for the following responses: • Tidal Power • Geothermal Power.	2 x 1		2
	(ii)	State how Energy Source B is intended to generate renewable energy.			
		Answers relating to energy production using geothermal sources can be awarded up to **two** marks, based on: • Water or working fluid is heated. (1) (or used directly in case of geothermal dry steam power plants). (1) • It is then sent through a steam turbine where the thermal energy (heat) is converted to electricity. (1) • This phenomenon is called electromagnetic induction. (1) Credit any other valid responses.	2		2
	(iii)	Explain **two** disadvantages of using Energy Source A to generate renewable energy.			
		Award up to maximum of **two** marks each for **different** disadvantage explained within the response, based on: • Tidal systems can change coastal structures. (1) • They can increase silt deposits. (1) • They can affect marine migration. (1) • They are prone to damage in high seas / stormy conditions. (1) • The suitable locations are highly limited as tidal systems can cut off shipping lanes / access to rivers. (1) • Coastal erosion has increased in areas directly around tidal barrage. (1) • Local eco systems can be affected as the river mouth that sit behind the tidal lagoon see a drop in spawning fish and other marine life, affecting birds, insects and plant life. (1) Credit any other valid responses.	2 x 2		4

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Question		Answer	AO1	AO2	Total Mark
2.	(a) (i)	The four sides of the tray are made from medium density fibreboard (MDF). MDF is a sustainable material Describe **two** other properties of MDF that make it suitable for the sides of the tray.			
		Award up to maximum of **two** marks each for **two different** properties described within the response, based on: • MDF is grain free. (1) It can therefore be painted to achieve the finish in the photograph. (1) • MDF is lightweight. (1) It's portable, easy to carry. (1) • MDF comes in a standard thickness. (1) Therefore, is suitable for CNC machining. (1) • MDF is able to be glued and dowelled. (1) This means that the tray is secure and durable in its construction. (1) • MDF is available in 8x4 sheets. (1) This means that multiple trays can be made from a single sheet. (1) Credit any other valid responses. Do not credit: MDF is a sustainable material. This is noted within the question.	2 x 2		4
	(ii)	Explain how MDF can be considered a sustainable material.			
		Award up to 4 marks for responses which show an understanding, including both the positive environmental impact and the broader context: • MDF can be considered sustainable because it is made from wood fibres. (1) • It is often sourced from recycled wood products or fast-growing timber. (1) • It utilizes smaller, often waste wood materials that might otherwise go unused. (1) • This helps reduce the impact of deforestation. (1) • Modern manufacturing processes have become more energy-efficient, and some MDF products are now made using adhesives and binders. (1) • It's manufacture therefore is less harmful to the environment. (1) • When properly disposed of or recycled, MDF is less harmful than other materials like plastic or metal. (1) Credit any other valid responses.	4		4

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	(b)	Explain the reason for the red lines on the CAD drawing.			
		Award a maximum of **three** marks for responses which explain the reason for the red lines on the CAD drawing when manufacturing the tray handles using a CAM router, based on: • The red line is the tool path. (1) • It allows for the centre of the cutting tool to cut on it as a tool path. (1) • This ensures that the product is the black lines. (1) Credit any other valid responses.	3		3
	(c) (i)	State the name of **two** suitable 3D printing materials that could be used to make the coloured holders.			
		Award **one** mark up to a maximum of two marks for any of the following responses: • PLA • ABS • Polypropylene • PET. Credit any other valid responses.	2 x 1		2
	(ii)	Give **three** advantages to the designer of using 3D printing when rapid prototyping the new mug.			
		Answers explaining the advantages of 3D printing when rapid prototyping the new mug should be awarded up to **three** marks, based on: • 3D printing allows design ideas to develop faster, concepts can be produced physically same day. (1) • Time to market is reduced – this keeps competitors behind. (1) • 3D printing uses additive manufacturing so reduces waste possible in other methods. (1) • 3D printing builds confidence in the product prior to production. (1) • Clear communication of product, for testing. (1) • Able to expose the product with clients. (1) • Added confidence in the unveiling of new product at launch. (1) • Shapes / forms that are traditionally difficult to manufacture can be produced easily. (1) Credit any other valid responses.	3 x 1		3

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Question		Answer	AO1	AO2	Total Mark
3.	(a) (i)	Select the box that best describes a smart material.			
		Award **one** mark for: • Materials that react to external stimuli.	1		1
	(ii)	State the name of a suitable smart material that could be used in the new coffee mug.			
		Award **one** mark for any of the following responses: • Thermo-chromic paint • Thermo-chromic pigment • Thermo-chromic ink • Thermo-chromic film.	1		1
	(iii)	Describe how this material functions.			
		Answers that indicate an understanding of thermochromic inks should be awarded up to **three** marks based on: • The mug will initially appear black with the sleeping face. (1) • As hot contents are poured in, the temperature change initiates a reaction. (1) • This reaction activates the white coloured finish with alert face. (1) • The process reverses as the liquid gets cold. (1) Credit any other valid responses.	3		3
	(b) (i)	Using the drop-down lists, identify the smart material on the left and match it up with the correct use for the chosen smart material on the right.			
		Award **one** mark, up to a maximum of two for the following responses: • Nitinol • Frames for eyeglasses.	2 x 1		2
	(ii)	Using the drop-down lists, identify the smart material on the left and match it up with the correct use for the chosen smart material on the right.			
		Award **one** mark, up to a maximum of two for the following responses: • Hydrogels • Babies nappies.	2 x 1		2

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	(c)	Explain how 'technology push' influences the development of smart materials.			
		Award a maximum of **three** marks for a response that describes the roll 'technology push' plays in the development of smart materials, based on: • breakthroughs in technology or scientific discoveries lead to the creation of new products or solutions. (1) • technological advancement which provides enhanced opportunities to improve a product. (1) • drives the development of products which might include smart or modern materials. (1) • allowing products being produced to use new or improved manufacturing techniques. (1) • improving the performance or the efficiency of a product which makes this desirable for the target market. (1) • a new product being developed which is superior to competitor products. (1) Credit any other valid responses.	3		3
	(d) (i)	State what is meant by the term 'the internet of things'.			
		Award up to **two** marks for an explanation of IoT, based on: • The Internet of Things (IoT) refers to a network of products. (1) • They are embedded with sensors, software, and other technologies (1). • They are able to connect to the internet or to each other. (1) • These devices collect and exchange data. (1) • This enables automation and remote control. (1) Credit any other valid responses.		2	2
	(ii)	Give **two** examples of how 'the internet of things' is used in product development.			
		Award **one** mark each for **two different** examples noted within the response, based on*:* • Smart home devices like thermostats, lights, and security cameras that can be controlled via a smartphone. (1) • Wearable devices like fitness trackers that monitor health data and sync it to apps. (1) • Smart appliances like refrigerators that can track inventory and send notifications when items are running low. (1) Credit any other valid responses.		2 x 1	2

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Question		Answer	AO1	AO2	Total Mark
4.	(a)	Explain how Frank Lloyd Wright's buildings represent his 'organic architecture' philosophy.			
		Answers that indicate an understanding of Frank Lloyd Wrights 'organic architecture' philosophy should be awarded up to **three** marks, based on: • For Wright, organic architecture meant designing buildings that were in tune with the land. (1) • Using materials that were locally sourced. (1) • Using materials that complemented the natural landscape. (1) • He focused on creating spaces that felt connected to the earth. (1) • Form and function came together in a unified way. (1) • Candidates may refer to specific examples, for example, Fallingwater, a house built over a waterfall, which perfectly demonstrates the integration of the building with its natural environment. (1) Credit any other valid responses.		3	3
	(b)	Discuss why Frank Lloyd Wright's architecture still influences architects today.			

		Answers that discuss why Frank Lloyd Wright's architecture still influence architects today should be awarded up to **five** marks, based on:
		• Frank Lloyd Wright's architecture remains popular and influential today due to several key features and ideas that revolutionized the design world.
		• These elements not only made his buildings unique in his time but also continue to inspire contemporary architects.
		• The core aspects of his work that influence architects today are:
		  • Integration with Nature (Organic Architecture)
		  • Innovative Use of Space
		  • Use of Natural Light
		  • Innovative Structural Elements and Materials.
		  • Emphasis on Horizontal Lines and Low, Ground-Hugging Designs
		  • Innovative Use of Technology and Design Systems
		  • Personal Vision and Legacy
		  • Architectural Symbolism.
				5	5

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Guidance for Markers:

Band	AO2
3	**5 marks** • an excellent response, with clear and detailed references regarding Wright's influence on architects today
2	**3-4 marks** • a good response, with some clear references regarding Wright's influence on architects today
1	**1-2 marks** • a limited response, with little reference regarding Wright's influence on architects today
0	**0 marks** • no response attempted or incorrect response

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Question		Answer	AO1	AO2	Total Mark
5.	(a) (i)	The frame of the bicycle carrier is made from aluminium tubing. Select the correct term for aluminium from the list below.			
		Award **one** mark for: • Non-Ferrous metal.		1	1
	(ii)	Give **three** advantages of using aluminium for the bicycle carrier.			
		Award **one** mark each for **three different** advantages noted within the response, based on: • The strength to weight ratio – relatively easy to carry, but extremely safe and sturdy. (1) • Little additional mass to the vehicle on which it is placed. (1) as it is lightweight (1) • The resistance to corrosion in outdoor situations. (1) • Responses relating to colour and finish (aesthetics) may also be acceptable, for example, Aluminium can be finished in a variety of ways / colours (1) to fit in with the range of vehicle colours. (1) Credit any other valid responses.		3 x 1	3
	(b)	Describe **two** properties of ABS that make it a suitable material for the clamp of the bicycle carrier.			
		Award up to maximum of **two** marks each for **two different** properties explained within the response, based on: • ABS providing robust, strong and tough material. (1) This is required for the clamp to hold the bicycle frame securely. (1) • ABS can be injection moulding. (1) This is the most appropriate manufacturing technique for producing the identical clamps required. (1) • ABS is non-corrosive. (1) This makes it suitable for outdoor use / weather resistant. (1) • ABS can have a textured finish applied. (1) This allows the users to have an ergonomic / tactile interface with the product. (1) Credit any other valid responses.	2 x 2		4

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<table>
<tr><td></td><td>(c)</td><td colspan="4">Discuss the properties of the rubber polymer that make it appropriate for the quick release strap.</td></tr>
<tr><td></td><td></td><td>Award a maximum of five marks for responses that describe the relevant properties of the rubber polymer, based on:
• Rubber is flexible.
• It has good tensile strength.
• This enables it to securely hold a variety of bicycle wheel diameters.
• The strap needs to have good tear resistance which rubber provides.
• It has built in grippy property that will hold the wheels securely.
• It can also withstand and remain stable in range of temperatures and weather conditions.</td><td></td><td>5</td><td>5</td></tr>
<tr><td></td><td></td><td colspan="4">Guidance for Markers:

<table>
<tr><th>Band</th><th>AO2</th></tr>
<tr><td>3</td><td>5 marks
• an excellent response, with clear and detailed references regarding the appropriateness of the rubber polymer</td></tr>
<tr><td>2</td><td>3-4 marks
• a good response, with some references regarding the appropriateness of the rubber polymer</td></tr>
<tr><td>1</td><td>1-2 marks
• a limited response, with little reference regarding the appropriateness of the rubber polymer</td></tr>
<tr><td>0</td><td>0 marks
• no response attempted or incorrect response</td></tr>
</table></td></tr>
<tr><td></td><td>(d)</td><td colspan="4">The bicycle carrier features two separate locks.
Explain why two separate locks are necessary.</td></tr>
<tr><td></td><td></td><td>Answers relating to the reason for two separate locks should be awarded up to three marks, based on:
• The two locks are used for different functions. (1)
• The lock attached to the clamping mechanism is to fully secure the bicycle when held by the cycle carrier on the roof of the car. (1)
• The second lock provides a method of locking the cycle carrier to the roof bars of the car. (1)

Credit any other valid responses.</td><td>3</td><td></td><td>3</td></tr>
</table>

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Question		Answer	AO1	AO2	Total Mark
6.	(a)	Give **two** 'market pull' factors that have resulted in the design of the auxiliary handle.			
		Award **one** mark each for **two different** factors noted within the response, based on*:* • why the Target Market require the auxiliary handle. (1) • the specific need was identified as a result of market research (1) • responses noting the target market, for example, elderly or those with physical difficulties. (1) Credit any other valid responses.		2	2
	(b)	Select the sentence that best describes anthropometrics.			
		Award **one** mark for: • Anthropometrics involves studying human sizes.		1	1
	(c) (i)	The product life cycle graph below shows how the sales of the auxiliary handle occur over time. State what happens to product sales at each of the 4 stages in the graph.			
		Answers relating to describing what happens at each stage of the life cycle graph should be awarded **one** mark each, up to a maximum of four, based on: • At the first stage, the product is released onto the market. (1) • The second stage, the product begins to sell more / become more popular. (1) • The third stage is when sales reach their highest. (1) • The fourth stage shows the product is in decline and sales fall. (1) DO NOT award a mark for the term only e.g. Launch, growth, peak, decline.		4 x 1	4
	(ii)	Explain the impact on the manufacturer at point A in the graph below.			
		Answers explaining the impact on the manufacturer at point A should be awarded up to **three** marks, based on: • The manufacturer will need to supply the highest demand. (1) • Sales are at their peak. (1) • Profits are at their highest point. (1) • Production will be under pressure in order to ensure consumers receive the product. (1) • Manufacturers want to avoid products going 'out of stock' as there is a risk of no sale. (1) Credit any other valid responses.		3	3

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	(iii)	State **two** possible benefits to the consumer of purchasing the product at point B.			
		Award **one** mark each for **two different** benefits noted within the response, based on*:* • Surplus stock. (1) • Product price is lower. (1) • Consumer could benefit from a range of clearance strategies, for example, end of line stock, closing down sales. (1) • Positive effect on the consumer. Grabbing a bargain! (1) Credit any other valid responses.		2	2
	(iv)	Discuss what options the manufacturer has once the product has reached point B on the life cycle graph.			
		Answers explaining the options available to manufacturer at point B should be awarded up to **four** marks, based on: • The manufacturer can end production. (1) • The manufacturer can withdraw the product from the market. (1) • The manufacturer could boost sales using promotion. (1) • The manufacturer could release a revitalised version/model of the product. (1) • The manufacturer could release a completely new product that supersedes the previous product. (1) • The manufacturer offers any remaining stock 'on sale' price to clear current product in readiness for a new release / upgrade. (1) Credit any other valid responses.		4	4

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Mapping of questions to specification content and assessment objectives:

Unit 1 – Product Design (Core Knowledge and Information)

Question			Mark allocation							
			Topic and Section					Total Marks	AO1 Marks	AO2 Marks
			1.1.1	1.1.2	1.1.3	1.1.4	1.1.5			
1	(a)	(i)				✓		2	**2**	
		(ii)				✓		2	**2**	
		(iii)				✓		4	**4**	
2	(a)	(i)						4	**4**	
		(ii)						4	**4**	
	(b)							3		**3**
	(c)	(i)						2	**2**	
		(ii)						3	**3**	
3	(a)	(i)						1	**1**	
		(ii)						1	**1**	
		(iii)						3	**3**	
	(b)	(i)						2	**2**	
	(b)	(ii)						2	**2**	

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	(c)							3	**3**	
	(d)	(i)						2		**2**
	(d)	(ii)						2		**2**
4	(a)						✓	3		**3**
	(b)						✓	5		**5**
5	(a)	(i)						1		**1**
		(ii)						3		**3**
	(b)							4	**4**	
	(c)							5		**5**
	(d)							3	**3**	
6	(a)		✓					2		**2**
	(b)			✓				1		**1**
	(c)	(i)		✓				4		**4**
		(ii)			✓			3		**3**
		(iii)			✓			2		**2**
		(iv)			✓			4		**4**

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Unit 1 – Product Design (In-depth)

Question			Mark allocation										
			Topic and Section								Total Marks	AO1 Marks	AO2 Marks
			1.1.22	1.1.23	1.1.24	1.1.25	1.1.26	1.1.27	1.1.28	1.1.29			
1	(a)	(i)									2	**2**	
		(ii)									2	**2**	
		(iii)									4	**4**	
2	(a)	(i)		✓							4	**4**	
		(ii)		✓							4	**4**	
	(b)						✓				3		**3**
	(c)	(i)				✓					2	**2**	
		(ii)					✓				3	**3**	
3	(a)	(i)				✓					1	**1**	
		(ii)				✓					1	**1**	
		(iii)				✓					3	**3**	
	(b)	(i)				✓					2	**2**	
		(ii)				✓					2	**2**	
	(c)					✓					3	**3**	
	(d)	(i)				✓					2		**2**

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		(ii)				✓					2		**2**
4	(a)	(i)									3		**3**
	(b)										5		**5**
5	(a)	(i)	✓								1		**1**
		(ii)	✓								3		**3**
	(b)				✓						4	**4**	
	(c)				✓						5		**5**
	(d)								✓		3	**3**	
6	(a)										2		**2**
	(b)										1		**1**
	(c)	(i)									4		**4**
		(ii)									3		**3**
		(iii)									2		**2**
		(iv)									4		**4**

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